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THE JOURNAL OF

THE INSTITUTION OF PRODUCTION ENGINEERS

TECHNOLOGY DEPT.

Vol. 31, No. 1, January 1952

PUBLISHED BY THE INSTITUTION, 36 PORTMAN SQUARE
LONDON W.1 TELEPHONE WELBECK 6813/7

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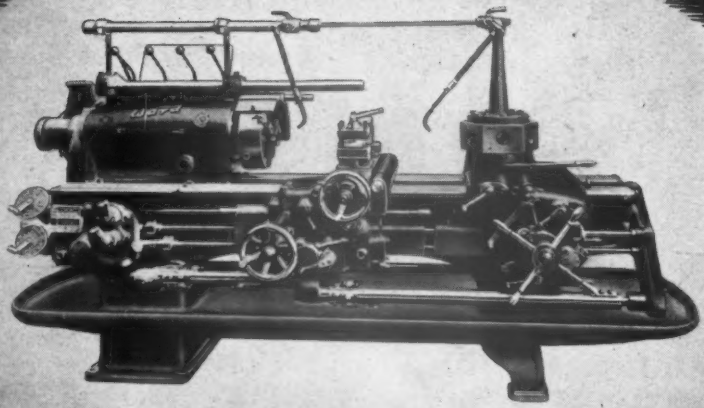

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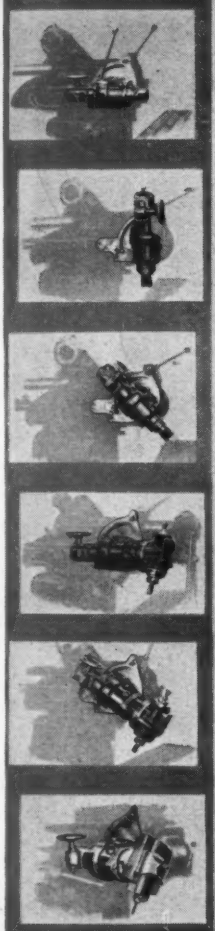

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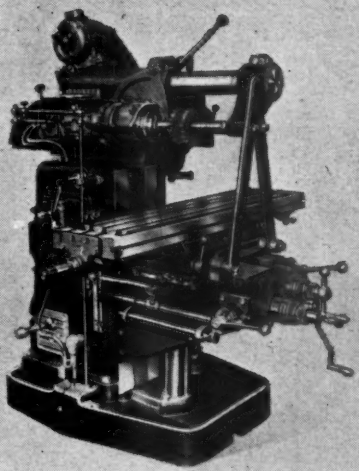

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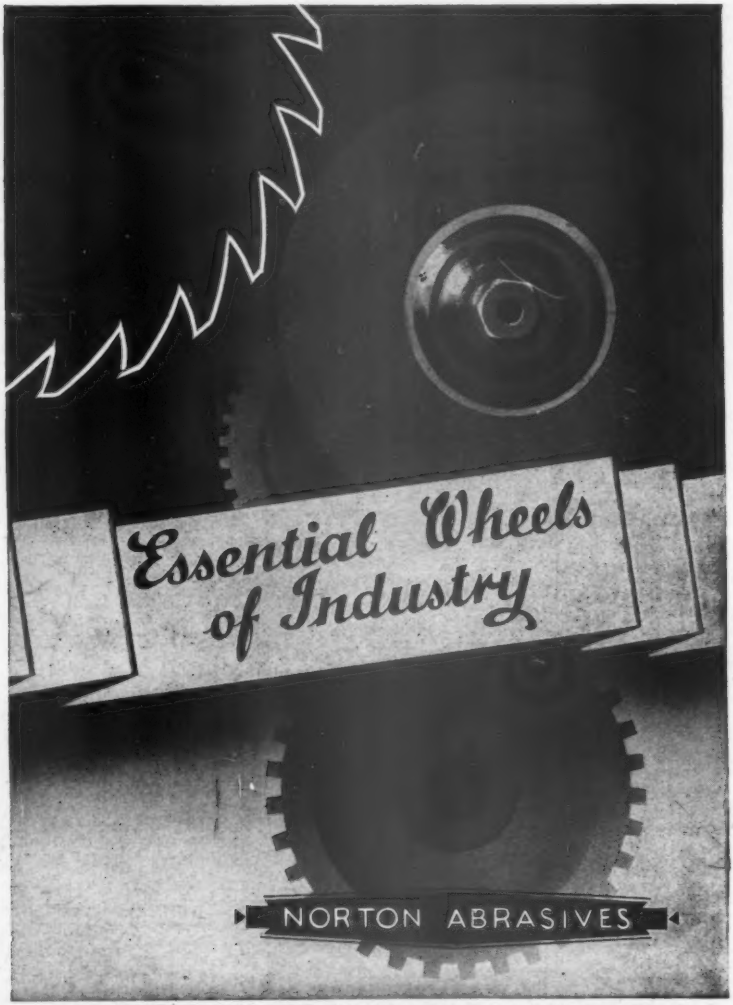

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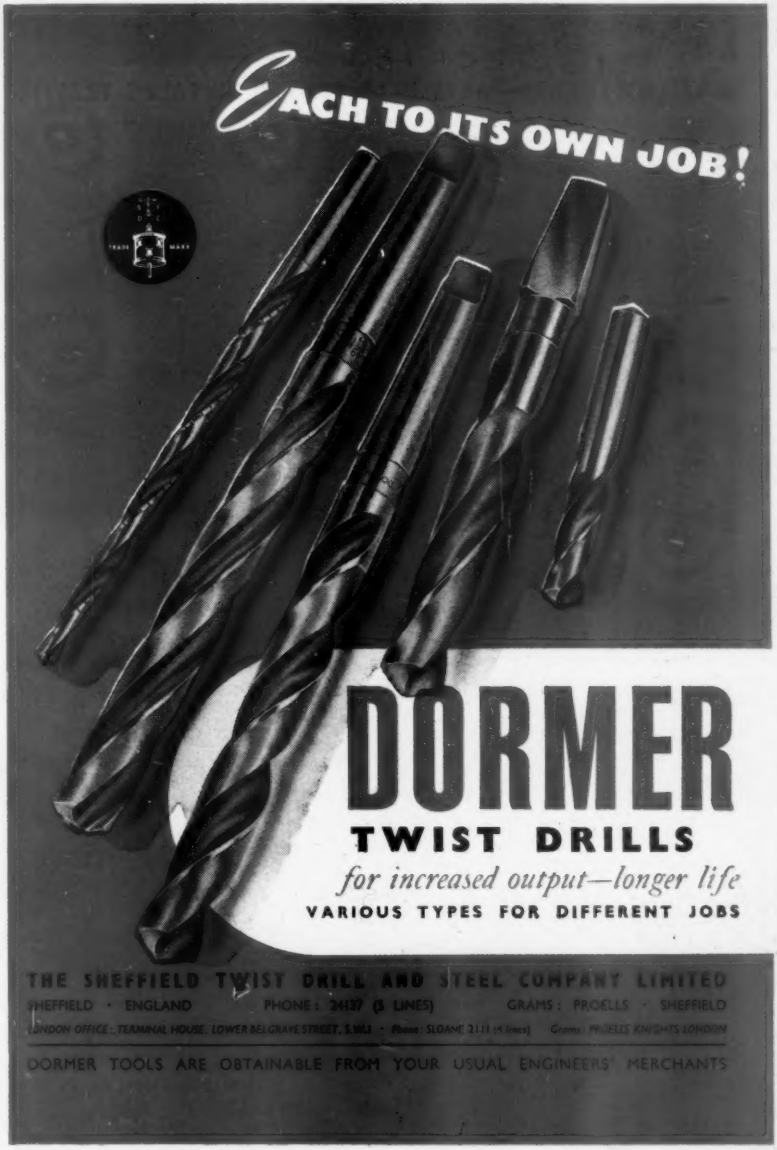
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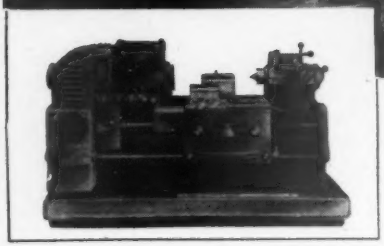

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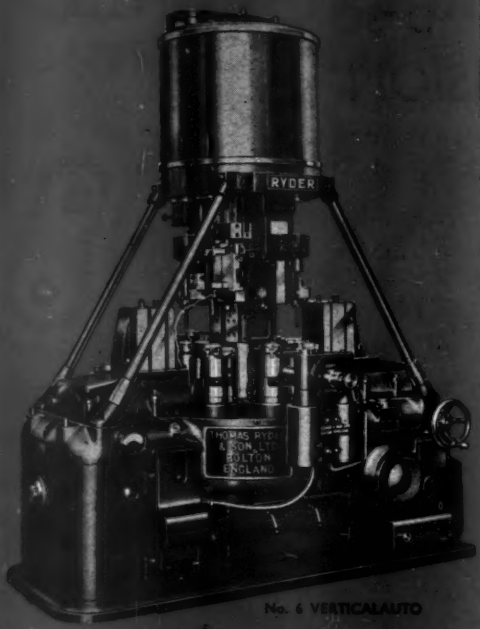

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Number of Spindles . . 6
Number of Tooling Stations . 5

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Maximum Swing . 14⅜" dia.
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Number of Tooling Stations . 5

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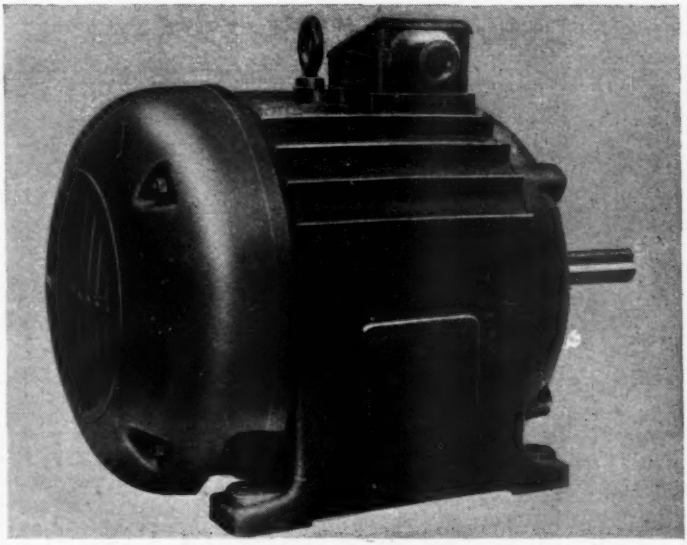

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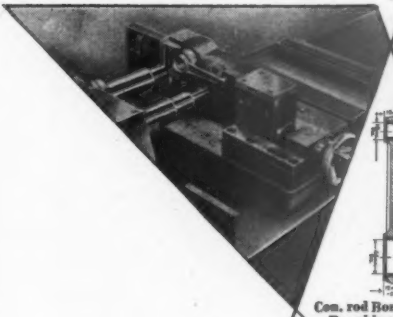

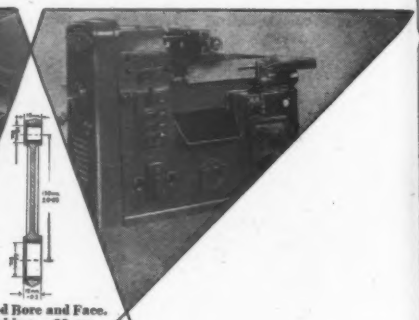

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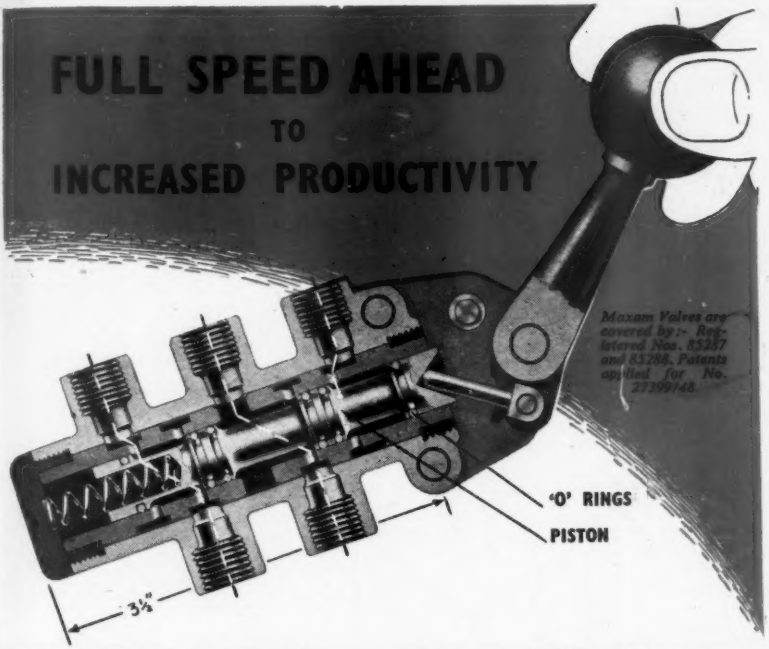

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treat them alike . . .

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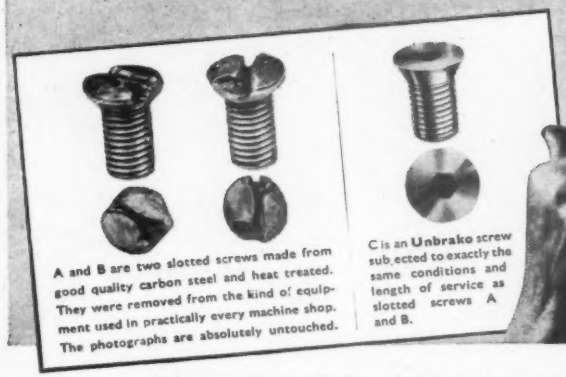

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THE JOURNAL OF

THE INSTITUTION OF PRODUCTION ENGINEERS

Vol. 31, No. 1, January 1952

Contents

Annual General Meeting	1
Institution Notes	21
Australian Sub-Council	21
Whitworth Scholarships	21
West Wales Sub-Section Visit	22
Conference on Heat Transfer	23
News of Members	23
Library Abstracts	25
Graduate Activities	30
"Design and Application of Tungsten Carbide to Blanking and Piercing Press Tools" by K. L. Pickett, Grad.I.Prod.E.	31
Report of Council Meeting, November 1951	62

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Notice of

ANNUAL GENERAL MEETING

Notice is hereby given that the Annual General Meeting of the Institution will be held on Wednesday, 23rd January, 1952, at the Institution's Headquarters, 36, Portman Square, London, W.1 at 7 p.m.

AGENDA

1. Notice Convening Meeting.
2. Minutes of previous Annual General Meeting.[1]
3. Report on Election of Members to Council.[2]
4. Annual Report of the Council.[3]
5. Presentation of Statement of Income and Expenditure and Balance Sheet and Auditors' Report.[4]
6. Election of Auditors, 1951–52.
7. Election of Solicitors, 1951–52.
8. Votes of Thanks.

By Order of the Council,
W. F. S. WOODFORD, *Secretary.*

[1] *See pages* 2/3.

[2] *See page* 4.

[3] *See pages* 5/16.

[4] *See pages* 17/20.

MINUTES OF THE ANNUAL GENERAL MEETING HELD ON THURSDAY,

25TH JANUARY, 1951.

The Twenty-ninth Annual General Meeting of the Institution was held on Thursday, 25th January, 1951, at 4 p.m., at the Headquarters of the Institution, 36, Portman Square, London, W.1. The President of the Institution, Major-General K. C. Appleyard, C.B.E., T.D., D.L., J.P., was in the Chair.

Notice convening Meeting

The Secretary (Mr. W. F. S. Woodford) read the notice convening the Meeting.

Minutes of previous Annual General Meeting

The Minutes of the previous Annual General Meeting, which had been published and circulated to members in January, 1951, were, on the motion of Mr. J. E. Hill, seconded by Mr. B. G. L. Jackman, confirmed and signed.

Election of Members of Council

It was moved, seconded and carried that the list of Members of Council for 1950–51 be received and approved.

Annual Report of the Council and Presentation of Statement of Income and Expenditure, Balance Sheet and Auditors' Report

The Chairman of Council (Mr. Walter C. Puckey, F.I.I.A.) presented the Annual Report of the Council together with the Statement of Income and Expenditure, Balance Sheet and Auditors' Report for the year ended 30th June, 1950, which had been circulated to members with the January, 1951, Journal, and moved their adoption. The Vice-Chairman of Council, Mr. Harold Burke, M.I.Mech.E., seconded the motion.

The Chairman of Council was congratulated on an excellent Report and the President then put the motion for the adoption of the Annual Report, which was carried.

Statement of Income and Expenditure, Balance Sheet, and Auditors' Report for the year ended 30th June, 1950

On the motion of Mr. J. E. Hill, seconded by Mr. B. G. L. Jackman, the Statement of Income and Expenditure, Balance Sheet and Auditors' Report, were adopted.

Election of Auditors

On the motion of Mr. E. C. Gordon England, seconded by Mr. R. M. Buckle, Messrs. Gibson, Appleby & Co., Chartered Accountants, of Aldwych House, London, W.C.2, were re-elected Auditors to the Institution, for the year 1950–51, and were thanked for their services during the year.

Election of Solicitors

On the motion of Mr. J. D. Scaife, seconded by Mr. T. Fraser, C.B.E., Messrs. Syrett & Sons, Solicitors, of John Street, Bedford Row, London, W.C.1, were re-elected Solicitors to the Institution, for the year 1950–51 and were thanked for their services during the year.

Votes of Thanks

Mr. M. Seaman proposed a vote of thanks to the Institution's Principal Officers. The Institution was fortunate in having a President who was in contact with all the high authorities in the country, and who was a person of influence; he was, indeed, the essence of leadership. Mr. Puckey, as Chairman of Council, was the real architect of the Institution's future policy, and the magnificent work which he had done could not be too strongly emphasised. He was ably supported by the Vice-Chairman and the Chairmen of Standing Committees.

The vote of thanks was carried with acclamation.

The President thanked Mr. Seaman for the kindly way in which he had proposed the vote of thanks. As President he saw a great deal of what went on and of the activities of Mr. Puckey, and the amount of energy which he put into the Institution's work frequently astonished him. The Institution was also greatly indebted to Section Honorary Secretaries, who did a fine job, as did the Chairmen of Section Committees, the Secretary of the Institution and all members of Head Office staff.

The President thanked the members present for their attendance and the proceedings then terminated.

REPORT ON
ELECTION OF MEMBERS TO COUNCIL

In accordance with Article of Association No. 33 (c), six of the twelve elected members of Council (five Members, one Associate Member) retired by rotation.

Nine nominations were received for the five vacancies for elected Members, and, as a result of the ballot conducted in accordance with Article of Association No. 35, the following were elected:—

Mr. H. W. Bowen.
Mr. R. M. Buckle.
Mr. R. C. Fenton.
Professor T. U. Matthew.
Mr. F. Bernard White.

For the one vacancy for the elected Associate Member, only one nomination was received. This Associate Member was, therefore, automatically elected:—

Mr. E. D. Broome.

Ballot papers were circulated to 4,986 Corporate Members in the United Kingdom and it is interesting to note that almost double the number of papers was returned compared with the previous year. Details of the voting, issued by the Institution's Auditors, are as follows:—

Eligible papers included in the Ballot ...		1,565
Rejected:—		
Incorrect number of votes recorded ...	23	
Papers not marked in ink	9	
Spoiled papers	5	
Envelopes unsealed	2	
Insufficiently stamped—returned to the postmaster—unrecorded	—	
Papers received after closing date ...	26	
		65
Total number of papers		1,630

The full list of Council members for the current year is published in the Journal.

REPORT OF COUNCIL

1st July, 1950/30th June, 1951

To be presented by the Chairman of Council at the Annual General Meeting, 23rd January, 1952

ONCE again I have the privilege of setting before you a record of the events within the year July 1st, 1950 to June 30th, 1951. It was a year distinguished by steady growth among our members ; of close and constant co-operation among those senior members to whom you entrusted the affairs of the Institution. Many of the difficulties present during my first year of office were largely overcome and only the external scene, both at home and abroad, showed little sign of being released from the strains of the post-war years.

FINANCE The Balance Sheet and Statement of Income and Expenditure are published in the January 1952 Journal, so all members will have had an opportunity of studying them. In accordance with the requirements of the Companies Act, the Accounts of our Sub-Councils in Australia and South Africa and of the Sections in Bombay, Calcutta and New Zealand have been amalgamated with the United Kingdom Accounts.

The Accounts this year have been presented in a modified form, so as to give members a clearer picture of the Institution's financial position. Expenditure has been grouped under certain main headings and shillings and pence have been omitted.

It gives me considerable satisfaction to report the continued improvement of the Institution's financial position. Two years ago, which was the last year of our old subscription rates, we suffered a deficit of £7,500 on the year's working ; last year this deficit was converted into a modest surplus of £496 by the introduction of increased rates of subscription. This year we show a surplus of £2,759, out of which your Council have allocated the sum of £2,000 towards the cost of a new building. Some members forecast that the increased subscriptions would have an adverse effect on the Institution's membership and I am glad that the figures now under review completely disprove this pessimistic forecast. You will notice that our subscription income shows an increase of 10 per cent. over the previous year, this additional subscription income being due *entirely* to increased membership.

There has been a modest increase in our income from investments and our Journal Receipts also show a considerable increase.

Thus our total income for the year was a little over £4,000 greater than in the previous year. Your Finance & General Purposes Committee are keeping a very watchful eye on expenditure, but the Institution is engaged in the battle against rising costs just as we all are.

Details of expenditure with comparative figures for the previous year are published in the Journal, so I need refer only to one or two particular items. Some of the increases in expenditure reflected in the Accounts are due directly to rising costs. In the course of its business, the Institution consumes great quantities of paper, the price of which has increased in some grades by as much as 300 per cent. during the past year. On the other hand, some of the increases are due to the Institution's expanding activities. It will be noticed, for example, that the expenditure in Local Sections is £800 more than last year ; this is a very healthy sign which I hope will continue, as will also the careful scrutiny of costs by Section Presidents.

As a result of changes in the administration we have been able to reduce the amount of our expenditure on salaries in spite of the general increase in salaries which has taken place during the year.

The net effect of all this is an increase in expenditure over the previous year of only £2,000. Thus our surplus of income over expenditure for the year amounted to £2,759, an increase of £2,263 over the previous year. Of this, your Council have decided to transfer the sum of £2,000 towards the new Building Fund, which will asist the Institution in the acquisition of new Headquarters when the lease of our present premises expires in a few years' time.

MEMBERSHIP The total membership of the Institution at 30th June, 1951, was 8,738, showing the following comparison with last year :—

	1951	*1950*
Honorary Members	9	6
Members...	1410	1324
Associate Members	4080	3649
*Intermediate Associate Members	349	570
Associates	161	153
Graduates	1896	1675
Students	645	751
Affiliated Firms	188	196
Total	8738	8324

* This grade will cease to exist in 1953.

This shows a net increase over the year of 414 members in all grades. It is possible that the introduction of our Associate Membership Examination may temporarily reduce the number of new members entering the Institution, but, in spite of this, our membership is still increasing. Although this increase may be regarded in some ways as satisfactory, I am convinced that there is still a very large number of fully qualified Production Engineers outside our ranks. We need the help of these men. The services which the Institution can render to the profession and to industry at large are directly related to the support which is forthcoming from individual professional men. The greater the number of able and qualified men there are within the ranks of the Institution, the greater will be the Institution's influence. It may truly be said of the Institution that " the whole is greater than the sum of its parts."

During the year, the following three members were elected to Honorary Membership of the Institution :—

J. Finlay, M.B.E., " in view of his great work on behalf of the Institution in Australia, his fathering of the Sydney Section to its present position and also his work on the Sub-Council . . ."

J. A. Hannay, " in recognition of his outstanding services to the Institution over a period of many years . . ."

J. D. Scaife, " in recognition of his unfailing service to the Institution since its foundation . . ."

Mr. E. P. Edwards has retired from the Chairmanship of the Membership Committee after more than ten years in office. The members of the Membership Committee made a small presentation to Mr. Edwards as a recognition of the extremely valuable work he has done in raising the membership standards of the Institution. Mr. R. L. Paice has been elected Chairman for the ensuing year.

EDUCATION The first of the new Associate Membership Examinations was held during the last week of May 1951. There were 90 candidates, of whom 27 successfully passed in Part I, 32 in Part II, and 7 in Part III. The numbers were considerably lower than those for the last of the old Graduateship Examinations which was due, in the main, to the fact that the new regulations had been in force only for some eight months when the first examination was held.

There is every indication that there will be a considerable increase in the number of candidates for 1952.

It has been suggested that there is a weakness in fixing the arbitrary age limit of 35 in connection with the Institution's

Associate Membership Examination. Your Council recognises this weakness and steps are being taken to remedy this.

The increase in the number of Colleges offering courses for the Higher National Certificate in Production Engineering continues, although, as I said to you last year, results in terms of increased numbers of certificates awarded will not be apparent for some two years. Members in industry should, wherever possible, encourage young men who are preparing for a career in Production Engineering to enter for these courses where they are offered. Colleges provide the facilities and rely on industry for the support needed if courses are to be continued successfully.

Owing to a most generous gesture on the part of the Austin Motor Co. Ltd., the sum of money available for the Lord Austin Prize has been doubled this year, and will continue to increase until 1955, when the capital value of the award will be £600. The interest on this sum will enable an annual award of £21 to be made.

Schofield Scholarships. Messrs. B. E. Stokes and W. N. Aspinall, the two 1950 Schofield Scholars, presented excellent Papers to very well attended meetings in their Sections after they returned from the United States of America. Messrs. F. W. Walton and A. H. Needham were awarded the Scholarships for 1951 and visited the United States and Switzerland respectively. As part of a reciprocal exchange arrangement, Mr. A. Salzmann from Switzerland has visited this country. Thanks to the generosity of two firms in which Council Members hold senior appointments, he has had a most successful visit.

Your Council have planned to extend the scholarship scheme to enable Graduates from Commonwealth countries to visit Great Britain, and hopes that an Australian Graduate will be arriving in the United Kingdom to carry out a six months scholarship visit early in 1952.

An excellent Summer School was held in 1951 at University College, Durham, although the number attending was disappointing. Plans are being made for the 1952 Summer School to be held in the Midlands area, which, it is hoped, will be more readily accessible to the majority of members.

Mr. W. E. Park has been elected to succeed Mr. F. H. Perkins as Chairman of the Education Committee.

INSTITUTION AWARDS The following Awards were made during the year :—

Institution Medal—for the best Paper presented by a *non-member* for the year 1949/50 to Mr. C. S. Johnson for his Paper entitled " Modern Foundry Practice."

Institution Medal—for the best Paper presented by a *member* during the year 1949/50 to Mr. J. S. Paget for his Paper entitled " Works Organisation for Research and Development of Aircraft Engines."

Lord Austin Prize 1950—for the best essay by a Graduate to Mr. G. N. Johnson for his essay entitled " Production Economy in Aircraft Manufacture."

Hutchinson Memorial Award 1949/50—for the Best Paper presented by a Graduate to Mr. H. G. Bottomley for his Paper entitled " Developments of Production Grinding Machines."
Schofield Travel Scholarships 1951 awarded to Mr. A. H. Needham and Mr. F. W. Walton.

TECHNICAL AND PUBLICATIONS COMMITTEE

The Journal. During the year, your Technical and Publications Committee have made, strenuous efforts to improve the Journal. A number of criticisms of the present format have been made, but extensive enquiries show that the balance of opinion is for retaining the Journal in its present size.

Neverthless, popularity is not the only factor to be considered, and the economics of production may yet prove to be a more forceful argument in favour of changing the size of the Journal. This matter is being kept constantly under review.

As a result of the negotiations to which I referred earlier, which have effected a reduction in the cost of producing the Journal, it has been possible to publish more editorial matter in the Journal. It is now the practice to publish two Papers each month, in addition to other material. However, even with this improvement, it is tsill possible to publish only a small number of the papers which are presented to the Institution. For this reason, it is intended to publish each month a list of papers received and which may be borrowed from the Hazleton Memorial Library.

Institution Papers. It was announced at the Institution Conference at Harrogate that the Institution had decided to establish " Institution Papers," to be presented each year. These Papers will be presented by men of eminence and authority and they will be given at the invitation of the Institution. As a tribute to two members to whom the Institution owes a lasting debt of gratitude for their services to the profession, one of the Institution Papers will be known as the " Viscount Nuffield Paper " and another as the " Sir Alfred Herbert Paper." The first of these Institution Papers will be presented early in 1952 and the author will be Mr. F. H. Rolt, O.B.E., of the Metrology Division of the National Physical Laboratory.

The introduction of these Papers is an important step in the Institution's history, and it is hoped that they will be major contributions to the profession.

Mr. L. Bunn has been elected Chairman of the Technical and Publications Committee, in successsion to Mr. A. L. Stuchbery.

HAZLETON MEMORIAL LIBRARY

The Library has grown steadily during the year and now contains over 2,000 volumes. In addition, more than 120 periodicals are regularly received. The Abstracts published monthly in the Journal have proved very popular and valuable assistance in their preparation has been rendered by members.

By far the greatest use of the Library is reflected in the demands made on the reference and information services which we offer. These facilities are being increasingly used as an "industrial intelligence service" and clearly are of great value to members.

The Right Hon. Lord Sempill, A.F.C., was re-elected Chairman of the Committee. Mr. H. G. Shakeshaft, who has done invaluable work for the Committee as Vice-Chairman in the absence abroad of Lord Sempill, was re-elected Vice-Chairman.

STANDARDISATION

The Standards Committeee have continued their work in close co-operation with the British Standards Institution and the B.S.I. have expressed their appreciation of the valuable services rendered by our members. At present 118 members of the Institution are serving on 85 of the B.S.I. Technical Committees.

The Standards Committee have been asked by the Ministry of Supply to comment on the specifications for Ball and Roller Bearings for the use of Government Departments. Although unspectacular, the work of the Standards Committee is a very important activity of the Institution.

Members who have any ideas concerning standardisation should submit these to the Standards Committee for their consideration and presentation to the B.S.I.

Mr. J. E. Baty has retired from the Chairmanship of the Committee after six years and the Council wish to record their sincere appreciation of the very valuable services to standardisation which Mr. Baty has given. He is succeeded in the Chairmanship by Mr. C. M. Holloway.

RESEARCH

The main work of the Research Committee during the year has been concentrated on the Joint Committee for the Measurement of Productivity, which was set up jointly with the Institute of Cost & Works Accountants in 1948. This Committee

has recently published a Report on " Measurement of Productivity—Applications and Limitations " which has aroused considerable interest throughout industry.

A report on " Time Study Training " is also being prepared and will be published early in 1952.

Because of extreme pressure of other business, I was reluctantly compelled to resign as Joint Chairman of this Committee, and Mr. B. H. Dyson has been elected Joint Chairman to succeed me.

Observations which were made during the National Survey of Time Study Rating Practice, which was conducted by the Department of Engineering Production of the University of Birmingham with the assistance of the Institution, are now being analysed. The detailed report of the findings is likely to be published in the near future.

The Materials Handling Sub-Committee has been reconstituted under the Chairmanship of Mr. T. W. Elkington and is now busily engaged on an active programme.

The work of the Research Committee could be considerably extended if the services of a full time Technical Officer were available. Council hope that the improvement in the Institution's financial position will enable this appointment to be made in the fairly near future.

Sir Lionel Kearns, C.B.E., has been re-elected Chairman of the Research Committee.

LOCAL SECTION ACTIVITIES

The activities of Local Sections of the Institution have continued to be as vigorous and as manifold as in previous years. It would be impossible for me to review all their activities within the bounds of this short report, but I would like to place on record an expression of appreciation of the great debt of gratitude which the Institution owes to the Officers and Committees of its Local Sections.

During the year, the Derby Sub-Section and the Reading Sub-Section were raised to full Section status, and both these new Sections are making steady progress.

The Western Section have established a Graduate Section and the Eastern Counties Section have been busy in the Norwich area with a view to the establishment of a Sub-Section there.

Over 300 Section Lecture Meetings were held during the year in addition to the many interesting Works Visits and social functions which were arranged.

A particularly successful event was the One-Day Conference on Materials Handling, which was arranged by the Birmingham Section in June. The Institution's thanks are due to the Directors of Messrs. Fisher & Ludlow, Ltd., for providing the facilities which enabled this Conference to be held in their Works.

In March a Conference of Representatives of Graduate Sections was held. This Conference was very well attended and was of such value to the Graduates that it has been decided to hold a similar Conference next year.

The London Graduate Section are again to be congratulated upon arranging another Continental Industrial Tour. Some 25 Graduates spent a fortnight visiting a wide range of Works in France. The London Graduates also organised a successful week-end school which was held in Dorking, Surrey. These activities are of great value to junior members of the Institution and I hope that other Graduate Sections will follow the splendid example of the London Graduates.

A Conference of Section Honorary Secretaries of the Institution was held in May 1951, to consider the administrative problems of the Institution and to ensure the utmost co-operation between Sections and the Headquarters. Mr. R. A. P. Misra, representing the Calcutta Section, was able to attend this Conference and made a valuable contribution to the discussion.

Outside the United Kingdom, the Institution goes from strength to strength. In *Australia*, another Section has been established in Adelaide, in addition to the two very flourishing Sections in Melbourne and Sydney. Mr. Charles Pullen, Honorary Secretary of the Australian Sub-Council and also of the Melbourne Section, visited Great Britain during the year and was a most welcome visitor to Headquarters, where he was able to have useful discussions. Mr. Sam Downie from Sydney was another visitor to Great Britain during the year and took back with him to Australia recorded messages from the President and other Officers of the Institution.

Much valuable work has been carried out in India during the past year and the successful activities of both the Bombay and Calcutta Sections are doing much to enhance the prestige of the Institution in the country. Council have given approval for the formation of a Graduate Section in Bombay and it is hoped that this will be firmly established in the near future. Col. C. Warren-Boulton, President of the Bombay Section and Mr. J. Warren-Boulton, Honorary Secretary of the Calcutta Section, have both visited Great Britain during the year and brought good news of the Institution's progress in India.

Our Section in *Auckland, New Zealand*, are making steady progress in spite of the serious difficulties which confront them.

The *South African Sub-Council* are considering the possibility of establishing a Section in Durban and the possibility of a Section in Southern Rhodesia is also under review.

Although there are some legal difficulties in the way of formally establishing a Section in *Canada*, our membership there is very active indeed. Most of our members are concentrated in the

vicinity of Toronto, Province of Ontario, and informal meetings are being held. On the occasion of the International Trade Fair, our members in Canada organised an informal dinner party at which members visiting the Fair from Great Britain were most welcome guests.

In addition to those members already mentioned, a number of other members from Sections outside the United Kingdom have visited Great Britain during the year. These members and other visitors from Sections outside the United Kingdom are always very welcome at Headquarters and at Section Meetings. At the same time, numbers of members from Great Britain have visited various parts of the Commonwealth and Empire, where they have been most cordially received by our fellow members in those countries. It is not too much to claim that the Institution, in its own small way, is making an important contribution to cementing the bonds of brotherhood which exist throughout the British Commonwealth of Nations.

HARROGATE CONFERENCE

I think I may say without hesitation that the Conference which was held at Harrogate from 28th June to 1st July was one of the most successful events which the Institution has ever held. The four Principal Speakers gave Addresses of the highest order. In the Discussion Groups, the short Papers prepared by the Discussion Leaders provoked first-class discussions. Full reports of the Addresses and Discussions have since been published in the Institution's Journal.

The Conference Dinner, which was graced by the presence of the Lord Archbishop of York, was an occasion which will long remain in the memory of those members who were fortunate enough to be present ; while the Reception and Dance given by the Mayor and Corporation of Harrogate at the end of the Conference was a most enjoyable occasion. The first-class programme which had been prepared by a Sub-Committee under the Chairmanship of Dr. Schofield, together with the adequate administrative arrangements which were made by the permanent staff, combined to make the occasion one which reflected great credit on the Institution.

INSTITUTION ANNUAL DINNER

The Annual Dinner was held at the Dorchester Hotel on 2nd October, 1950, when the then President of the Board of Trade, the Right Hon. Harold Wilson, O.B.E., P.C., M.P., was the Guest of Honour. Ample publicity has already been given to this event, and there is no need for me to add anything further.

ANGLO-AMERICAN COUNCIL ON PRODUCTIVITY The Institution has co-operated closely with the Anglo-American Council on Productivity, especially in connection with the setting-up of the various Specialist Teams which have visited the United States of America. Many members of the Institution have been selected to join these Productivity Teams.

APPOINTMENTS BULLETIN A valuable additional service to members which has been introduced during the year is the Appointments Bulletin, which is circulated with the Journal each month. Your Council do not consider it desirable that the Institution should maintain an Appointments Bureau, but they believe that the Bulletin offers better service to members. The popularity of the Bulletin is indicated by the rapid increase in the number of vacant appointments which are advertised each month. This rapid increase is, by the way, another indication of the way in which Production Engineering is becoming an essential technique in the affairs of the nation.

SPECIAL COMMITTEE ON ORGANISATION Towards the close of the previous year your Council set up a Special Committee with the following Terms of Reference :—

> " To conduct a General Survey of the Whole Organisation of the Institution and Make Recommendations as to Improvements which will enable the Institution the more efficiently to attain Its Object."

The following members were elected to serve on this Committee :-

The Vice-Chairman of Council, Mr. H. Burke (*Chairman*)
The President
The Chairman of Council
J. Blakiston (Halifax)
E. D. Broome (London)
R. S. Brown (Bristol)
H. Gardner (Glasgow)
J. E. Hill (Yorkshire)
B. G. L. Jackman (Birmingham)
R. W. Mann (Newcastle-upon-Tyne)
A. Oppenheimer (representing the Graduates)
Dr. H. Schofield (Leicester)
C. H. T. Williams (Sheffield)

This Committee met regularly during the year and have prepared a report containing a number of important recommendations which are receiving the serious consideration of Council.

MEETINGS OF COUNCIL In order to be able to devote more time to the consideration of important matters of Institution Policy, your Council have modified the procedure at their Meetings. Routine business has been considerably reduced in

order to allow more time for debates on major policy at each Council Meeting.

HEADQUARTERS STAFF During the year the appointment of Mr. W. F. S. Woodford as Secretary of the Institution was confirmed. At the same time, Mr. S. Caselton was appointed Assistant Secretary (Administration) and Mr. G. E. Knight was appointed Assistant Secretary (Education & Membership). These Officers have been in the service of the Institution for a number of years, and your Council feel that these promotions are in the best interests of the Institution. The Institution is very well served by its permanent staff, and I should like to record my appreciation of the loyal and conscientious way in which they all discharge their duties.

HONOURS It was recorded with very much pleasure that the following members have been honoured by His Majesty the King :—

P. H. Muirhead	C.B.E.
E. Sanders	O.B.E.
A. J. Charnock	O.B.E.
S. R. Howes	O.B.E.
W. R. Snell	M.B.E.

OBITUARY It is with regret that the deaths of 25 members during the year must be recorded. Of these, I should like particularly to mention the late Sir Harry Harley, O.B.E., the late Mr. H. J. Gibbons, the late Mr. Fred Grover, Honorary Member, and the late Mr. J. Murphy, to all of whom the Institution is particularly indebted for their considerable services to the profession and to the Institution.

SERVICES OF MEMBERS It is fundamental to the organisation of a profession such as ours that a great deal of the professional work of the Institution should be accomplished by the voluntary services of members. Not only are we indebted to those who have held office in the Institution, but also to the many other members who in various ways have rendered service to the Institution during the year. Without their continued loyalty and interest, the Institution's activities would be severely curtailed.

CONCLUSION I referred earlier to the national and international conditions within which each of us has to work. The last year has shown little, if any, relief to our nation's economic position and little relief in world tension. Last year I said that each of these strains was a challenge to the Production Engineer. Our standard of living, our defence strength, depend greatly on the productive power of our people and productive power, in turn, is

generated mainly by those who possess the knowledge and the enthusiasms such as are found within the membership of our Institution.

Realisation of this is both our responsibility and our inspiration.

May I conclude this annual review on a personal note. Happy the man who is lucky in his associates, and particularly in his chief. In our President, General Appleyard, I, and indeed we, have been particularly fortunate. As a chief he has been a great source of strength ; as a President, who has given much time and great influence to us, he has been invaluable. On your behalf I would like to say how grateful we are for his wise counsel and inspired leadership.

THE INSTITUTION OF PRODUCTION ENGINEERS

BALANCE SHEET as at 30th June, 1951

1950	ACCUMULATED FUNDS AND SURPLUS	£	£
£			
24,429	The Viscount Nuffield Gift	25,027	
100	The Lord Austin Prize Fund	100	
100	The Hutchinson Memorial Fund	100	
			25,227
1,526	Leasehold Premises Sinking Fund	1,653	
900	Dilapidations Reserve Fund	1,000	
			2,653
—	New Building Account		2,000
	Life Subscriptions: *less* amount transferred to		
727	Income and Expenditure Account		739
6,608	Income and Expenditure Account...		7,369
34,390			37,988
736	Hazleton Memorial Library	433	
—	Melbourne Prize Account	51	
			484
848	Schofield Scholarship		59
	CURRENT LIABILITIES		
1,978	Sundry Creditors	3,852	
168	Subscriptions Received in Advance	218	
	Bank Overdraft 3,601		
	Less Balances in hand on Petty Cash and		
2,685	Sections Accounts 2,463		
		1,138	
			5,208
£40,805			£43,739

KENELM C. APPLEYARD, *President.*
W. C. PUCKEY, *Chairman of Council and Finance Committee.*
W. F. S. WOODFORD, *Secretary.*

1950	FIXED ASSETS	£	£
£			
3,481	Leasehold Premises at cost ... ... (Depreciation is provided by a Sinking Fund)		3,481
	Furniture, Fittings and Plant at the net amount standing in the Institution's books at 30th June, 1948	1,531	
	Additions	3,514	
		5,045	
3,691	*Less* Depreciation to date	818	
			4,227
24,629	Fund Investments at cost: as scheduled ... ... (Market Value £22,848)		25,227
2,426	Sinking Fund Policies: as scheduled ... ... (Premiums Paid)		2,653
34,227			35,588
	CURRENT ASSETS		
3,857	Sundry Debtors, Deposits and Stocks	5,283	
1,132	General Investments at cost: as scheduled ... (Market Value £961)	1,134	
850	United Building Society—Deposit (South Africa)...	1,250	
739	Cash at Bank—Hazleton Memorial Library and Melbourne Prize Accounts	484	
			8,151
£40,805			£43,739

Report of the Auditors to the Members of The Institution of Production Engineers:

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper books of account have been kept by the Institution so far as appears from our examination of those books. Audited Balance Sheets and Accounts have been received from the South African, Australian, New Zealand, Calcutta and Bombay Sub-Councils and have been incorporated in the above Balance Sheet and annexed Income and Expenditure Account. We have examined the above Balance Sheet and annexed Income and Expenditure Account which are in agreement with the books of account audited by us and the audited Sub-Councils Accounts supplied to us. In our opinion and to the best of our information and according to the explanations given us the said Accounts give the information required by the Companies Act, 1948 in the manner so required and the Balance Sheet gives a true and fair view of the state of the Institution's affairs as at 30th June, 1951 and the Income and Expenditure Account gives a true and fair view of the excess of income over expenditure for the year ended on that date.

20, Bloomsbury Square,
London, W.C.1.
5th November, 1951.

Gibson, Appleby & Co.,
Auditors,
Chartered Accountants.

DETROIT PUBLIC LIBRARY

INCOME and EXPENDITURE ACCOUNT for the year ended 30th June, 1951 (including Overseas Sections)

1950 £		£	£
	To Establishment Charges—		
	Rent and Water Rate	240	
	Light, Heat and Cleaning	1,042	
	Repairs and Renewals	375	
1,428			1,657
	„ Administration Expenses—		
	Postage and Telephone	1,606	
	Printing and Stationery	3,399	
	Professional Charges and Insurance	53	
	Audit Fee	225	
	Travel, Entertaining and Meetings (other than Sections)	2,406	
	Miscellaneous	363	
6,152			8,052
15,643	„ Salaries		14,318
	„ Section Expenses—		
	United Kingdom	1,607	
	Overseas (Audit Fees £89)	2,110	
	Central Services	1,000	
3,955			4,717
	„ Journal—		
	Printing	9,631	
	Postage and Envelopes	1,188	
	Reporting	542	
10,621			11,361
102	„ Donations and Grants		164
	„ Miscellaneous—		
	Dinner—4th October, 1950	373	
	1950 Schofield Travel Scholarship	322	
	Cost of Appointments Bulletin (Net)	94	
	Summer School 1950	6	
255			795

1950 £		£	£
	By Subscriptions—		
	Renewals and Arrears	25,873	
	Transfers	433	
	New	2,379	
	Overseas	3,321	
	Entrance Fees	1,587	
30,563			33,593
977	„ Interest		1,104
9,006	„ Journal Receipts		10,193
45	„ Sale of Publications		96
79	„ Interest on War Damage Refund		—

	„ PROVISIONS—				
376	Depreciation—Furniture and Fittings		436		
100	Dilapidations Reserve		100		
127	Leasehold Sinking Fund...		127		
1,000	Schofield Scholarships 1951		500		
74	Structural Repairs Account		—		
341	Amount written off Stocks of Publications ...		—		
				1,163	
40,174				42,227	
496	„ BALANCE—Excess of Income over Expenditure carried down			2,759	
£40,670				£44,986	£40,670 £44,986

19

APPROPRIATION ACCOUNT

1950 £		£	1950 £		£
	To RESERVES—			By BALANCE at 1st July, 1951	6,608
	New Building Fund	2,000		„ EXCESS OF INCOME OVER EXPENDITURE brought down ...	2,759
	„ BALANCE carried forward	7,369		„ PROFIT ON SALE OF INVESTMENTS...	2
		£9,369			£9,369

INVESTMENTS, 30th JUNE, 1951

	£ s. d.	£ s. d.
Schedule of Fund Investments—		
The Viscount Nuffield Gift:		
£7,124 19 10 3½% War Stock	7,428 19 8	
£8,554 9 0 3½% Treasury Stock, 1977/80	8,598 4 2	
£9,038 0 0 4% Canadian Pacific Railway Perpetual Consolidated Debenture Stock	9,000 0 0	
		25,027 3 10
The Lord Austin Prize Fund:		
£95 8 5 3½% War Stock		100 0 0
The Hutchinson Memorial Fund:		
£95 8 5 3½% War Stock		100 0 0
		£25,227 3 10
Schedule of General Investments (Unallocated)—		
£274 12 0 3½% War Stock		290 0 0
£151 4 6 3½% Treasury Stock		152 0 1
£382 13 8 3½% War Stock		400 0 0
£190 16 11 3½% War Stock		200 0 0
£37 17 3 3½% War Stock		40 0 0
£50 2 6 3½% War Stock		52 10 0
		£1,134 10 1
Schedule of Sinking Fund Policies—		
Leasehold Premises Sinking Fund:		
Norwich Union Life Insurance Society Policy —Premium Paid		1,653 3 4
Dilapidations Reserve Fund:		
General Accident Fire and Life Assurance Corporation Ltd. Policy—Premium Paid...		1,000 0 0
		£2,653 3 4

INSTITUTION NOTES

January, 1952

AUSTRALIAN SUB-COUNCIL

The Institution announces with great pleasure that Sir John Storey, B.Sc., has accepted the Presidency of the Australian Sub-Council for the coming Session.

Sir John is, of course, one of the most prominent Australian industrialists, and is well-known in Great Britain. He is Chairman and Managing Director of Repco Ltd ; Managing Director of the Overseas Corporation (Aust.) Ltd., and Chairman of National Motorsprings Pty. Ltd., in addition to holding directorships in a number of other engineering concerns. He is Chairman of the Federal Council of the Institute of Management, and a Past President of this body and of the New South Wales Chamber of Manufacturers, and was at one time Director of the Department of Aircraft Production, Beaufort Division, and a member of the Aircraft Advisory Committee. He has been Chairman of the Immigration Planning Council since 1949, and was formerly Chairman of the Joint War Production Committee, Defence Dept.

The Institution, and in particular the Australian Sub-Council, is extremely fortunate that a man of such outstanding qualities has accepted this office.

WHITWORTH SCHOLARSHIPS

The attention of Students and Graduates is drawn to the notice issued by the Ministry of Education concerning Whitworth Scholarships for 1952. Full details of these awards and syllabus of the examination will be found in " Regulations and Syllabus for Whitworth Scholarships 1951." (His Majesty's Stationery Office.) Entry forms should be obtained from The Secretary, Ministry of Education (Awards Branch), 11, Bryanston Square, London, W.1. These must be completed and returned not later than the 15th January, 1952.

COURSE ON MATERIALS HANDLING

A course of ten lectures on Materials Handling, commencing on 17th January, 1952, has been arranged by the Borough Polytechnic at the request of the Regional Advisory Council for Higher Technological Education for London and the Home Counties.

The programme is as follows :—

Date	*Subject*	*Lecturer*
17th Jan., 1952	Introduction to Materials Handling	L. W. Bailey, F.R., Econ.S., A.M.I.Prod.E.

24th Jan., 1952	Basic Considerations	L. W. Bailey, F.R., Econ.S., A.M.I.Prod.E.
7th Feb., 1952	Organisation	Prof. J. R. Immer, M.Sc.,B.A., A.I.Prod.E
14th Feb., 1952	Analysis and Materials Handling Data	Prof. J. R. Immer, M.Sc.,B.A.,A.I.Prod.E.
21st Feb., 1952	Factors Affecting Handling Procedure	L. W. Bailey, F.R., Econ.S., A.M.I.Prod.E.
6th Mar., 1952	Factors Affecting Handling Equipment	F. T. Dean, M.I.Mech. E., M.I.Prod.E.
13th Mar., 1952	Basic Equipment I	F. T. Dean, M.I.Mech. E., M.I.Prod.E.
20th Mar., 1952	Basic Equipment II	F. T. Dean, M.I.Mech. E., M.I.Prod.E.
3rd. Apr., 1952	Equipment and Economic Analysis	F. T. Dean, M.I.Mech. E., M.I.Prod.E.
24th Apr., 1952	Case Studies	L. W. Bailey, F.R., Econ.S., A.M.I.Prod.E.

The lectures will be given on Thursday evenings at 7.0 p.m., and the fee for the course is Two Guineas. Applications for enrolment should be made to The Secretary, Borough Polytechnic, Borough Road, London, S.E.1.

WEST WALES SUB-SECTION VISIT

A most successful visit to The Steel Company of Wales Limited at the new Margam Works was organised by this Sub-Section on the 24th October, 1951.

Among the 45 members who attended were Major-General K. C. Appleyard, the President of the Institution, Mr. W. F. S. Woodford, the Secretary of the Institution, and the Presidents of the Dundee, Eastern Counties, Liverpool, South Wales, Southern and Western Sections.

A photograph taken during the visit to Margam

After seeing two films illustrating the development of the Margam project, the party visited the Blast Furnaces and Coke Oven Plant before being entertained to luncheon by Mr. Julian Pode, Managing Director of the Company, where the Institution's thanks were returned by the President and by the President of the South Wales Section and the Chairman of the West Wales Sub-Section. The President also paid tribute to the work of the Section Honorary Secretary, Mr. Sanderson, which had ensured the success of the visit.

The visit was continued during the afternoon.

The Sub-Section are planning a visit to the Trostre Works of the Company when they are in full production in the Spring of 1952.

DISCUSSION ON HEAT TRANSFER

It is announced by the Institution of Mechanical Engineers that the Proceedings of the General Discussion on Heat Transfer held in London during September, 1951, and continued at Atlantic City, New Jersey, U.S.A. in November, 1951, are about to go to press.

Copies of the Proceedings, which will cost £2 5s. each, should be reserved immediately. Orders and remittances may be addressed to Head Office at 36 Portman Square, London, W.1., cheques being made payable to " The Institution of Production Engineers."

NEWS OF MEMBERS

Mr. Wm. T. Baird, Associate Member, has been appointed Senior Production Engineer with the Armament Supply Department of the Admiralty at Bath.

Mr. H. P. Halfter, Associate Member, has joined H. M. Colonial Engineering Service as the Assistant Electrical Engineer, Gold Coast Railways, and is stationed at Takoradi.

Mr. R. G. Hoye, Associate Member, has been appointed Lock Works Manager with Chubb & Sons Lock & Safe Co. Ltd., Wolverhampton.

Mr. J. L. Ness, Associate Member, has been appointed Assistant Works Manager of the British Salmson Aero Engines Company.

Mr. G. W. Rhodes, Associate Member, has been appointed Assistant Grade B., with responsibility for Production Engineering, at the Darlington Technical College.

Mr. M. J. Sargeaunt, M.A.(Cantab.), Associate Member, has recently been appointed Technical Editor of " Machinery Lloyd."

Mr. J. O. Sheppard, Associate Member, is now General Manager, Wm. Pepper & Co., Ltd., Pickering, Yorks.

Mr. C. Vince, Member, has taken up the appointment of General Manager, with Wilkie & Paul Ltd., Edinburgh.

Mr. E. J. Wilkinson, Associate Member, has transferred from the Birmingham office of the Skefco Ball & Roller Bearing Company to the Manchester branch of that firm, and has taken up the appointment of District Manager.

Mr. K. Barry, Graduate, is now Assistant Planning Engineer with T. Smith & Sons (Rodley) Ltd., Leeds.

Mr. J. M. Gardner, Graduate, is now a Technical Assistant in the Research Department of D. Napier & Sons Ltd., Acton.

Mr. Wm. J. Humphrey, Graduate, is now employed as an Equipment Engineer with the Northern Electric Co., Ltd., Montreal.

Mr. J. G. Hyland, Graduate, has taken up an appointment as Technical Cost Engineer with the de Havilland Engine Co., Ltd., Edgware.

Mr. J. P. Pearson, Graduate, has been promoted to the grade of Leading Draughtsman at the Ministry of Supply Armament Research Establishment, Fort Halstead, Kent.

Mr. J. L. Whitely, Graduate, has taken up the post of Production and Methods Engineer with the Kirby Banks Screw Co., Ltd., Leeds.

Mr. G. Wittenberg, Graduate, is now Development Engineer with Sant Sturgess Ltd., London.

MEMBERS VISITING THE U.S.A. Members visiting America may like to know that one of our Associate Members, Mr. P. E. Goodwin, who is resident in Wakefield, Massachusetts, has written to the Secretary: "It would give me great pleasure in rendering to the Institution any services or assistance, within my power, which may help to make any Institution Member's stay in this country a memorable and happy one." Members wishing to take advantage of Mr. Goodwin's very generous offer should write to him at: 42, Avon Street, Wakefield, Massachusetts, U.S.A., or Telephone Telephone Crystal 9-0594R.

HAZLETON MEMORIAL LIBRARY

It would be helpful if, in addition to the title, the author's name and the classification number could be quoted when borrowing books.

ABSTRACTS

658.54 TIME AND MOTION STUDY

"Work Study" by R. M. Currie. *B.I.M., London.* 1951. *23 pages. Charts.* (Production Management Series 2.)

This booklet, written by the Head of the Work Study Section of Imperial Chemical Industries Limited, contains a brief summary of work study technique. The subject matter is presented in a clear and concise manner. Whilst the booklet does not claim to contribute any innovation to the function it does condense work study into a set of headings which are presented in chronological chart form.

621.81 MACHINE DESIGN

"Introduction to Mechanical Design" by T. B. Jefferson and Walter J. Brooking. *Ronald Press, N.Y.* 1951. *612 pages. Illustrated. Diagrams.* (Mechanical Engineering Series.)

Stressing is briefly covered and followed by a full section on materials, the forms in which these are used and various methods of fabrication. Machines are dealt with by chapters on frames, shafts and couplings, bearings, power transmission and linkages, miscellaneous parts such as springs, piping and containers and a short article on Standardisation, completes the volume.

621.753 TOLERANCES

"New Approach to Engineering Tolerances" by J. Gilson. *Machinery Pub. Co., London.* 1951. *99 pages. Diagrams.*

This book (by a member of the Institution) offers a comprehensive discussion on tolerances based on practical experience. An early chapter considers general tolerances for production processes. In addition to the commoner process, tolerances for powder metallurgy and ceramic pressings are considered. Further chapters consider the effect of tolerances on fit and the effect of tolerance accumulation on assemblies. Particular reference is made to the benefits which may be obtained from consideration of the probability of size distribution in a batch of components. The chapter devoted to the expression of tolerances on drawings suggests principles of dimensioning to suit the planned sequence of operations and methods for avoiding ambiguity. A new set of limit tables is outlined and the book concludes with a comprehensive draft for a "tolerance manual" for use in almost any manufacturing organization.

The text is illustrated with original diagrams and tables, and a bibliography is appended for further reference. The constructive foreword is by Mr. F. H. Rolt, M.I.Prod.E.

621.9 MACHINE TOOLS; MACHINING

"Practical ideas for machinists" by H. E. Linsley. *McGraw-Hill, N.Y.* 1950. *268 pages. Illustrated.*

Ingenuity and adaptability increase the capacity of both man and machine. Ideas and Handy tips for use when Drilling, Turning, Shaping, Planing, Milling, Grinding, Welding, Brazing and Soldering, Bench-work and Marking-out are concisely described in this volume. Typical ideas are concerned with Extension Holder for Drills, Screwcutting Coarse Threads Efficiently—8 TPI. in 6 Cuts—Cutting-off Saw applied to Shaper—Low-head powerful Work Clamp for Planing—Heavy Duty simple Flycutter for Milling—Cheap Chuck for Grinding Bevel Gear bores off the Pitch Diam.—Simple Component Holding Devices for Welding—Brazing—Soldering. Most are illustrated by drawings and all are covered by descriptive text. An index provided.

621.81 MACHINE DESIGN

"Design of machine elements" by M. F. Spott. *Allen & Unwin, London.* 1951. *402 pages. Diagrams.*

The author, as Professor of Mechanical Engineering at an American University, has knowledge of importance of design techniques to both students and practising engineers. His book contains data, on both theoretical aspects e.g. Mohn circle Resilience etc., and practical requirements of the design.

The chapters on belts, brakes and clutches; lubrication; ball and roller bearings and that on welded and riveted structures are likely to bring new information to established draughtsmen, estimation and planning men, and there are numerous worked out examples. Although standard units are

used throughout, the briefness of the derivations necessitates some prior knowledge of the subject, and of principle of integration applied to engineering calculations. Each chapter closes with a bibliography and a selection of appropriate examples, and each has explanatory diagrams.

621.9 MACHINE TOOLS

" Hydraulic controls on machine tools " by General Motors Institute. (n.p.) *The Institute.* 1951. *250 pages. Illustrated. Diagrams.*

This treatise on machine tool hydraulic controls caters for the needs of the machine tool designer and the shop floor maintenance engineer, with a readily assimilated, fully defined nomenclature. After dealing with fundamental definitions and principles it proceeds to deal with pumps and fluid motors, valves, cylinder assemblies, accumulators, oils, tubes, fittings, pipes, hose and reservoirs and packings. Here, as throughout, the technique adopted is to take the reader progressively from simple line diagrams through to comprehensive descriptions of all the commonly used intricate assemblies.

An example is the treatment of pumps and fluid motors. After illustrating, by simple diagrams, the principles of piston, gear and vane type pumps the chapter goes on to explain in detail the Hydraulic Press Manufacturing Co.'s " Hydro Power," the Oilgear Q type, Sundstrand variable delivery and the Vickers variable delivery piston type pumps. This is followed by the Barns, Vickers and Sundstrand constant delivery gear type pumps. It continues with the Vickers, Racine Tool and Machine Co.'s variable delivery and the Oilgear type D vane type pumps. In conclusion the chapter explains the application of centrifugal pumps in series, with and without differential valves and also pumps in parallel. The correct applications with reasons are indicated, together with servicing instructions throughout.

Thereafter follow diagrams and explanations of typical circuits to be found in a wide variety of machine tools of various makes including Vickers, Oilgear, Sundstrand, Ex-cello and Cincinnati as manufacturers. Boring, shaping, planing, broaching, turning and pressing are amongst the applications covered.

621.746 CASTING

" Die Casting Dies, Part 3." *Machinery Pub. Co., London.* 1951. *63 pages. Diagrams.*
(Machinery's Yellow Back series.)

This little book approaches the subject in a manner now familiar to users of the " Yellow Back " series ; it is one of seven dealing with various aspects of die-casting, and is concerned with problems of reliability thrown up by the extended development of semi-automatic machines. Numerous simple fool-proofing devices are described that employ mechanical, hydraulic, pneumatic and electronic elements, dependant upon the application.

The applications embrace devices to ensure correct operation when the dies close, correct core operation, prevention of dies opening during injection and prevention of wrongly timed metal injection. The forces required for core extraction, collapsible cores and cores for hinged assemblies, e.g. zip-fastener sliders, are all fully dealt with.

658.562 QUALITY CONTROL

" Quality control : principles, practice and administration " by A. V. Feigenbaum. *McGraw-Hill, N.Y.* 1951. *443 pages. Charts.*
(McGraw-Hill Industrial Organization and Management series.)

One of the McGraw-Hill Industrial Organization and Management series, this book presents Quality Control as a business method. The contents are divided into four self-contained sections :—

Part 1, presents Quality Control from the overall administrative aspect, and discusses its nature, potentialities and the results which may be

expected from it. This section is intended as an introduction of the system to administrative and executive personnel.

Part 2, presents the statistical aspect of Quality Control in simple language and deals with frequency distribution, control charts, sampling tables, etc. Some sampling tables are included in the text and a bibliography on the use of statistics in Quality Control is appended.

Part 3, deals with the application of Quality Control to plant problems. Examples are discussed and representative plans are outlined for various types of control, and information given on the application of Quality Control in job production shops.

Part 4, describes methods by which the difficulties met with in introducing Quality Control programmes have been overcome.

In general the book comprises a guide to Quality Control from the organizational, administrative and technical aspects, and the information and methods presented have been gained from experience in industry.

621.81 MACHINE DESIGN

"Ingenious mechanisms for designers and inventors, Vol. III" edited by Holbrook L. Horton. *Industrial Press, New York.* 1951. *536 pages. Diagrams.*

This volume is the third in a series started in 1930. The series forms a convenient collection of mechanisms contributed to "Machinery" by a number of authors. In common with the two earlier works, the original chapter headings have been retained to facilitate easy reference. Many aspects of automatic and semi-automatic mechanisms are considered. Chapter headings of particular interest are, Cam Applications, Locking Clamping and Locating Devices, Automatic Work Feeding and Transfer Mechanisms, Feeding Mechanisms for Power Presses and Hopper Selection Mechanisms for Automatic Machines. The final chapter headed "Miscellaneous Mechanisms" contains several devices of interest to designers of measuring apparatus. The book is illustrated with over 300 line diagrams and the subject matter is cross-indexed.

OTHER ADDITIONS

317.3 STATISTICS—U.S.A.

U.S.A.—Bureau of the Census. **"Historical Statistics of the U.S. 1789-1945."** A supplement to the Statistical Abstract of the U.S. Prepared by the Bureau of the Census with the co-operation of the Social Science Research Council. *Washington, U.S. Dept. Commerce.* 1949. *363 pages.*

331.2 WAGES; PAY

Industrial Welfare Society, London. **"Employee benefit schemes."** *Lond. The Society.* 1949. *63 pages.*

535.8 OPTICAL INSTRUMENTS

Jacobs, Donald H. **"Fundamentals of optical engineering."** *N.Y., McGraw-Hill.* 1943. *487 pages. Illustrated. Diagrams.*

613.6 INDUSTRIAL HYGIENE

Dallevalle, J. M. **"Industrial environment and its control."** *N.Y., Pitman Pub. Corp.* 1948. *225 pages. Diagrams.*

621.3577 ELECTRO-DEPOSITION; ELECTROPLATING

Field, Samuel, and Weill, A. Dudley. **"Electroplating: a survey of modern practice, including the analysis of solutions."** (6th Ed. Rev. and Enl.) *Lond., Pitman.* 1951. *546 pages. Diagrams.*

621.746 CASTING

Mond Nickel Company Ltd., London. **"Nickel in non-ferrous castings."** (4th Ed.) *Lond., The Company.* 1951. *Looseleaf. Illustrated. Diagrams.*

621.791 WELDING

British Electrical and Allied Manufacturers' Association (Inc.), London. **"Guide to British Electrodes, prepared and issued by the Arc Welding Electrode Section."** *Lond., The Association.* 1951. *45 pages. Illustrated.*

British Oxygen Co. Ltd., London. **"Handbook of instructions for operating equipment, oxy-gas welding and cutting and directions for assembling."** (Rev.) *Lond., The Company.* 1951. *56 pages. Illustrated. Diagrams.*

621.8 MACHINE PARTS

Link-Belt Company, Chicago. **"Link-Belt general catalog 900."** (n.p.) *The Firm.* 1950. *1,295 pages. Illustrated. Diagrams.*

621.83 GEARS

Ransome, S. M. **"Collection of three papers on the factors involved in getting the most satisfactory results, economically speaking, from gear hobbing machines."** *Rockford, Ill., Barber-Colman Co.* (n.d.) *59 pages. Diagrams.*

621.86 MATERIALS HANDLING

King, Geo. W. Ltd., Hitchin, Herts. **"Straw handling plant built and erected for Bowaters Lloyd Pulp and Paper Mills Ltd., Sittingbourne, Kent."** 1951. *24 pages. Photos. Diagrams.*

PAPERS RECEIVED

1829 **"Steel : Modern Trends—Selected Procedure Recommended to Users"** by G. M. Flather.

1830 **"Early Engineers"** by E. G. Bishop.

1832 **"Application and Selection of Electrical Equipment"** by N. V. Pestereff.

1833 **"Symposium on Modern Metrology"**—London Section.

1834 **"Construction and Use of a Management Expenditure Summary"** by A. G. Clark.

1835 **"Modern Accounting for the Production Engineer"** by W. Deacon.

1836 **"Developments in the Use of Aluminium Alloys"** by M. H. P. Le Vie.

THE LIBRARY Members are asked to note that until further notice the Library will not be open on Wednesday evenings or Saturday mornings, but will be open between 10 a.m. and 5.30 p.m. from Monday to Friday each week.

JOURNAL BINDERS Members are reminded that binding cases for the Journal are obtainable from Head Office, price 7/6 each post free. The cases, each of which will hold 12 issues of the Journal, are made of stiff board covered with imitation leather cloth, with gilt lettering on the spine.

RESEARCH PUBLICATIONS A number of copies of the following Research publications are still available to members, at the prices stated :

Report on Surface Finish, by Dr. G. Schlesinger	15/6
Machine Tool Research & Development	10/6
Practical Drilling Tests	21/-
Test Charts for Machine Tools, Parts 3 and 4	5/6 each

These publications may be obtained from the Production Engineering Research Association, "Staveley Lodge", Melton Mowbray, Leics.

ISSUE OF JOURNAL Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

IMPORTANT In order that the Journal may be despatched on time, it is essential that copy should reach the Head Office of the Institution not later than 40 days prior to the date of issue, which is the first of each month.

GRADUATE ACTIVITIES

GRADUATE REPRESENTIVES' CONFERENCE

It has been decided to hold the 1952 Graduate Representa tives' Conference on Saturday, 29th March , at Birmingham.

In addition to Graduate Sections' representatives, it is also intended to invite two Graduates from those local Sections where no separate Graduate Section exists. The Chairman of the organising committee has already written to all secretaries of such Senior Sections, and it is hoped that Graduates interested in attending the conference will contact them as soon as possible

TECHNIQUE OF TOOLING STUDY GROUP

This Session's subject : " The Preparation of Standard Tool Checking Charts " was introduced to members of the London Graduate Section Technique of Tooling Study Group by Mr. B. H. Dyson, M.I.Prod.E., F.I.I.A.

The aim of the Group is to tabulate the essential and desirable features of various elements of Tools, Jigs and Fixtures, e.g., the relative merits of different types of clamps, locating pins, guides and nests, with a view to preparing Standard Tool Checking Charts which can be applied in Tool Drawing Offices, Tool Rooms, Workshops, etc.

The Study Group Secretary, Mr. G. Wittenberg, 34, Barston Gardens, Earls Court, London, S.W.5, will be pleased to receive details of practical and numerical results of members', or Study Groups' investigations of similar projects.

DESIGN AND APPLICATION OF TUNGSTEN CARBIDE TO BLANKING AND PIERCING PRESS TOOLS*

by K. L. PICKETT, Grad.I.Prod.E.

To be presented to the Coventry Section of the Institution, 17th January, 1952

SINCE the introduction of tungsten carbide between the two World Wars, the application of it has progressed very rapidly beyond normal cutting tool work, with the result that it now covers most industries. Further, the number of applications is still increasing with the realisation of its uses, and has led into rather complicated and accurate tools demanding specialised knowledge. Such a development is that of its incorporation into blanking and piercing press tools, which is followed through basic principles, design and application, in the following paper.

BASIC PRINCIPLES To appreciate fully the design and application of tungsten carbide to press tools of any type, it will be of advantage to discuss some of the basic functions and design features of the normal type of steel tool, using as it does punches and dies of hardened steel. From this we can pass logically through the various steps and discussions leading up to the design and application of specific tool sets.

The functions of any blanking and piercing press tool are many, but in the main can be condensed into the following :—

(*a*) To produce simple flat pieces of required shape and accuracy.
(*b*) To produce them in quantity.
(*c*) To produce them economically.
(*d*) To produce them in good condition, i.e. without burrs.

To achieve these objects two basic types are usually sufficient to produce any shape given, viz. :—

(*a*) Compound types.
(*b*) Progressive types : (i) Simple ; (ii) Multi-stage.

In applying tungsten carbide to the compound type of tool, due to the component being produced at one stroke of the press the sections of steel required in the tool will be fairly weak, and in a complicated form tool would be even more so, therefore tungsten carbide cannot be applied, except in very simple types of tool such as that shown in Fig. 2, for making washer, Fig. 1. The progressive type of tool shown in Fig. 3, however, lends itself much more easily

**Note: This paper was awarded the Douglas D. Davis Prize, 1950/51.*

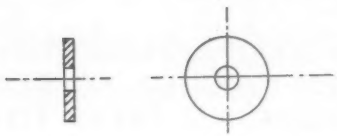


FIG. 1.

to tungsten carbide, as with the splitting of the blanking and piercing operations into separate parts much stronger construction of individual punch and die pieces can take place, and so this type of tool is usually favoured. This design, however, may give rise to inaccuracies, due to the number of stages required which demand additional skill in manufacture.

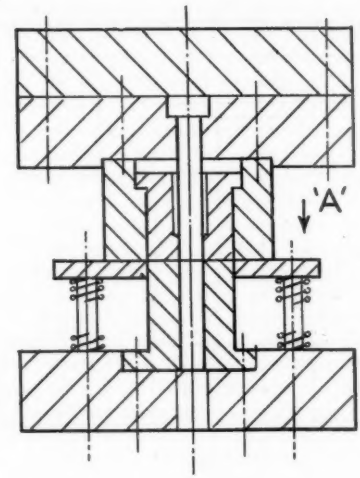
PRELIMINARY CONDITIONS PRIOR TO DESIGN

Prior to discussing design features when applying tungsten carbide it would be as well to consider the economics of the case, as it is well known that complicated tools utilising tungsten carbide, whether press tools or any other tools in Production Engineering, are relatively expensive due to the difficulty in working the material. From this it will be seen that an almost constantly running job would be the most suitable, which is why the main applications seem to be in the electrical and razor blade industries, although of course there are times when it can be applied to a job requiring a small number of parts when the difficulty of producing them necessitates tungsten carbide being used, or a certain number of further operations such as tumbling and de-burring are eliminated.

To build up some idea, therefore, of economy to be gained by the use of this material, attention must be given to performance to be expected and subsequent price, to obtain the overall economy compared with that of a steel tool.

As regards performance, tools used in the razor blade industry on carbon steel strip $\frac{7}{8}$ in. wide and approximately .005 in. thick, usually give in the order of 1,000,000 to 1,500,000 blades per regrind, the corresponding figure of the steel tools being 100,000. A further consideration is that of the amount to be removed on re-grinding punch and die faces, which with tungsten carbide is usually about .002 in. to .003 in., which compares very favourably with normal steel practice. In the electrical industry on transformer and rotor laminations, tungsten carbide tools produce up to thirty times that of steel tools on the normal types of material encountered.

Tungsten carbide, however, is at a disadvantage when comparing prices with those of steel tools, appearing at first sight a little costly,



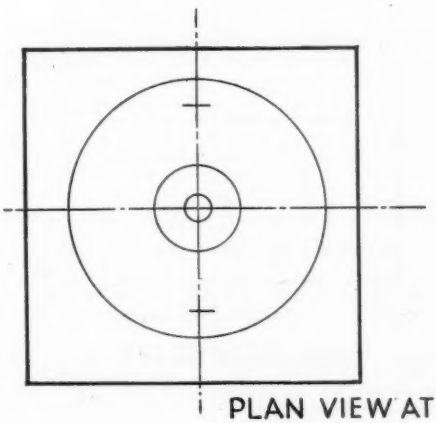
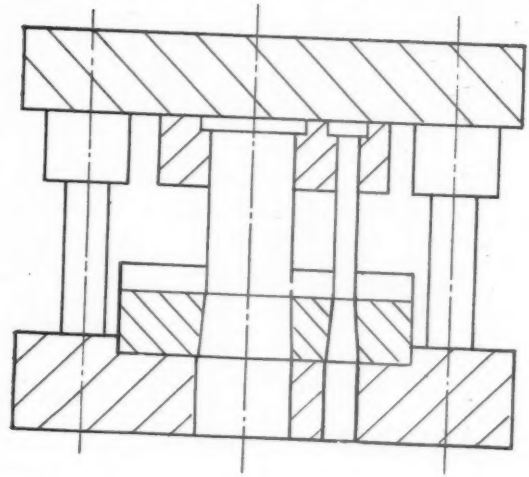
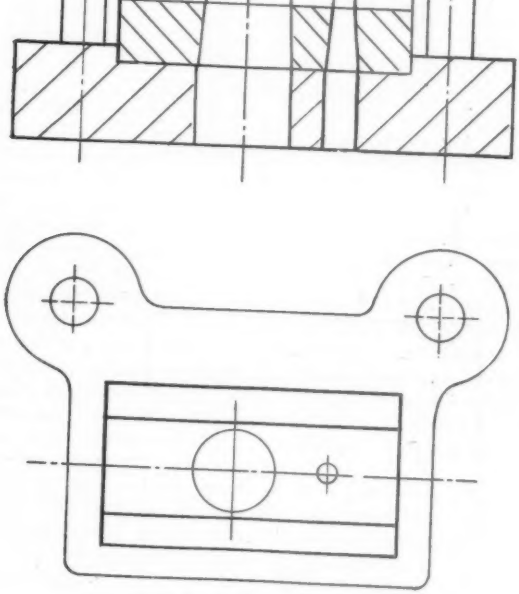


FIG. 2.





PLAN VIEW OF DIE

FIG.3.

being up to four times greater. The reason for the high price is not, as generally thought, due to the high cost of the carbide itself, but largely to the amount of work in grinding and lapping the intricate forms and assembling the sections, which requires many more man-hours than when forming steel sections.

PRESSES As is well known in Production Engineering, when applying tungsten carbide to turning tools, milling cutters, etc., one naturally thinks of the rigidity of the set-up and machines being used to make fullest possible use of the material. The same obviously applies to press tools and one or two points are worthy of attention : the type of press which can give maximum support and rigidity to the press tool is the Dieing Machine, although of course normal ' C ' type presses if in good condition will give reasonable results ; the slides on the machine must also be in very good condition and the top and bottom plates must be absolutely flat. As we are mostly concerned with large runs the feed mechanism will usually be of the roll feed type, giving suitable accuracy on pitch, although pilots to position the stock are necessary on most press tools. This is important, as if a punch should meet with the end of a strip it may tend to tip and snip the die, causing subsequent regrinding and greatly reducing the number of components obtained. The presses should be of robust construction, also the die set itself, and the use of four pillars and guide bushes to give maximum support is highly desirable.

DESIGN With the use of tungsten carbide press tools, the design factor is of major importance as a knowledge of the material itself, its disadvantages, faults, the way to handle it, shape it, etc., is essential, for the technique required is very different from normal practice.

Although much is known about tungsten carbide at the present time, it would be as well to enumerate some of the major points as follows :—

1. It is the hardest known material except diamond.
2. Grinding is the only means of shaping, and is a skilled operation.
3. Grinding should be kept to a minimum, bearing in mind that the rough carbide cannot be formed by any other method.
4. It is susceptible to cracking if it receives thermal shocks.
5. It is usually held by brazing to shanks in the form of tips when applied as turning tools, but mechanically secured tips are gaining in popularity.
6. It is relatively brittle, being strong in compression and weak in tension.
7. Under normal conditions it will not distort.

8. It cannot be drilled and tapped.
9. Any complexity of sections demands a fabricated arrangement to avoid weak sections.
10. The pitch of two or more holes in one block of carbide is difficult to maintain due to variation in shrinkage in the final sintering operation, necessitating an excessive grinding allowance in the holes to correct pitch errors.

With regard to design, therefore, we can conveniently begin by discussing the tool as shown in Fig. 3 for producing a simple washer.

You will notice throughout the various designs to follow that the tool does not differ outwardly from normal practice beyond the aforementioned strength requirements, the main point being the accommodation of tungsten carbide pieces in the general design features.

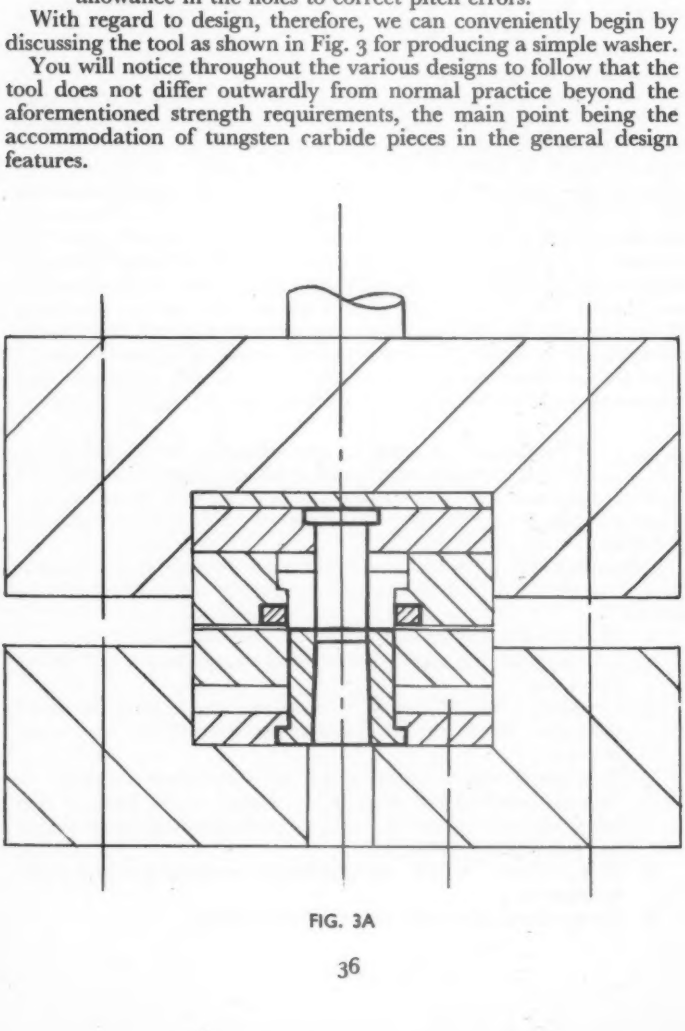


FIG. 3A

As mentioned previously, this tool can be either of the compound type or progressive type. In this instance, as the resulting sections are not unduly weak and the component to be used is only .007 in. thick, both types can be considered. Fig. 3A shows the compound tool, the tungsten carbide items being outlined darker than the steel parts. In the lower half of the tool a solid tungsten carbide insert has been utilised, being held mechanically. In the top half of the tool, the centre piercing punch is also of solid tungsten carbide, whilst the blanking die has a tungsten carbide ring inserted and brazed to a high tensile steel case. Fig. 4 shows the tool modified from the steel type as shown in Fig. 3, this type bringing out various points on the treatment of round punches and dies.

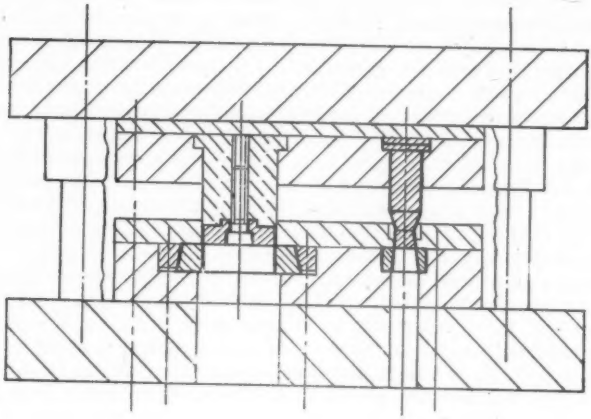
The design of the die can take several forms, that shown having solid tungsten carbide inserts. The larger diameter ring is held by wedges and the smaller ring by a light drive fit in the die plate. Other methods can be undertaken, however, such as brazing a ring into a steel body, as in the compound tool, or the ring can be shrunk in at a high temperature, giving an interference fit at room temperature. Rings of this nature are usually approximately up to 3 in. or 4 in. in diameter. Larger rings are not often met with in large quantity press tool work, but if so they require specialised treatment.

From Fig. 4 it will be noticed that the two positions are separated by two progressions, enabling suitable wall thicknesses of the bushes to be obtained, this being quite a common design difficulty. Treatment of round punches varies according to size. As shown, the piercing punch is of solid carbide and designed to have the greatest possible strength increasing the diameter behind the piercing diameter. Tipping of these small punches can be done but is not recommended. The head of the punch is shouldered for securing and is usually left proud and ground flush on assembly. This type of punch and all other round punches are normally rotary ground, the piercing diameter being lapped to remove grinding marks, whilst the shank is a good fit in the punch plate.

The larger blanking punch can be designed in a number of ways, either in solid tungsten carbide, tipped and brazed, or tipped and mechanically held. The solid tungsten carbide type would be preferred but the cost rather prohibits its use and so, say at $\frac{1}{2}$ in. diameter, the tipped design in one form or another becomes necessary. Fig. 5 shows a tip brazed on, whilst Fig. 6 shows a tip secured mechanically by means of a socket head screw.

Punches of diameters approximately $\frac{1}{2}$ in. to 1 in. are usually brazed, whilst above 1 in. they fit into the mechanically held category. When brazing, the thickness of braze should be kept to a minimum as the continued impact would cause a thicker braze to fatigue, and a breakdown would result.

The mechanically held type usually incorporates a ground



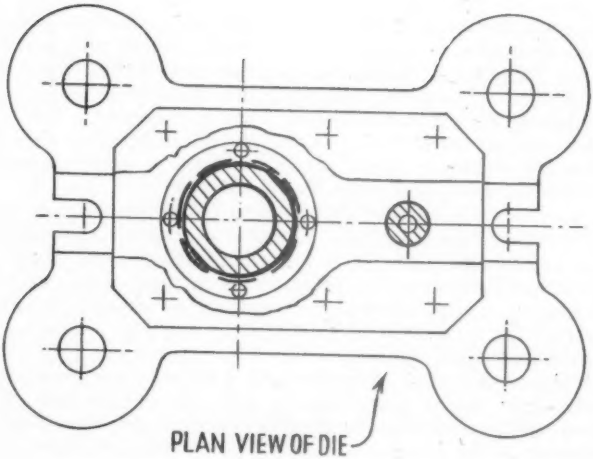


FIG. 4

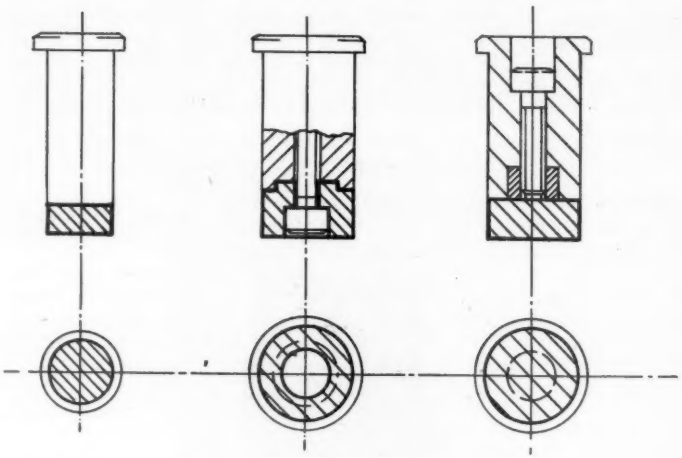


FIG. 5 FIG. 6 FIG. 7

register at the back for location purposes. A further example of securing mechanically is shown in Fig. 7, which gives a steel pad brazed onto the back of the tip and secured by a screw; this method is rather useful when treating large and irregularly shaped punches, as in Fig. 8, but care must be taken to ensure perfect "sit" of the carbide and steel pad on the mating faces, and also to ensure flatness at the back of the tip, which is rather difficult to obtain.

The use of a hardened steel backing plate behind the punches, as shown in Figs. 4 and 11, particularly behind the small solid tungsten carbide piercing punches, is further recommended.

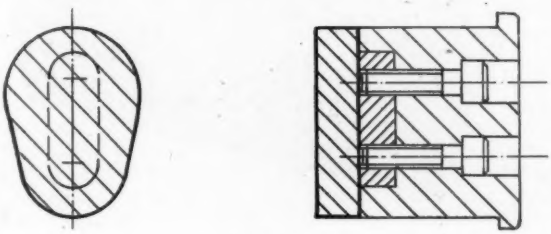


FIG. 8

SIMPLE FORM BLANKING TOOL

Before passing on to discuss the progressive type incorporating sectional die pieces, a word or so can be said on the simple blanking tool as shown in Fig. 9. The parts which are of interest to us are the two die blocks, which it will be noted have tungsten carbide pieces secured

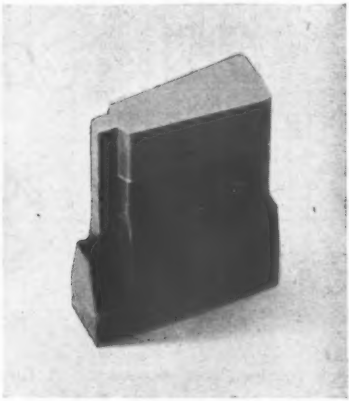


FIG. 9

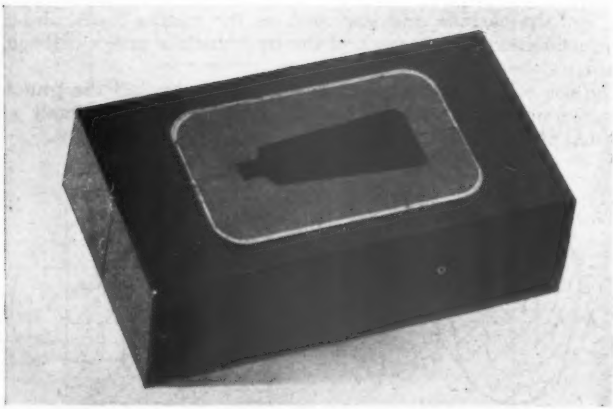


FIG. 9a

by brazing into the usual type of recess. This is normal practice for some of the smaller types of dies, and is also relatively cheap compared with solid tungsten carbide sections. A minimum braze will be necessary under the tip, whilst the shank material may be of .4 per cent. C. steel.

The punch as shown is of the brazed tip type, but can be produced in solid tungsten carbide, depending on the size, etc.

PROGRESSIVE TOOL WITH SECTIONAL DIES

Passing on from the requirements of the simple blanking tool, tools with more complicated shapes are quite often met with in the electrical industry, the press tools to produce them having been split up into many progressions to accommodate the various operations. A typical application is that of a press tool to produce the rotor and stator lamination as shown in Fig. 10. In this case, the layout of the press tool using hardened steel segments was able to be used for the incorporation of tungsten carbide almost entirely, and is illustrated in Fig. 11.

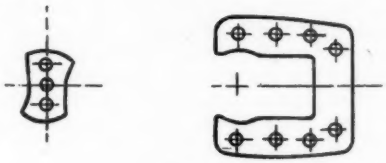


FIG. 10

One of the first things to notice in the design of this die set is the use in the stator blanking stage of solid tungsten carbide segments, these being split so as to avoid any awkward sections, or waste of carbide. The segments have a taper on the outer faces to enable them to be clamped by wedges, which do not bottom in the recess as can be seen, whilst the die form is located from segment to segment by the use of tenons. Of particular interest is the treatment of the centre piece which gives securing difficulties, and also calls for a pilot hole. Although this segment is secured at the outer end, the added precaution has been taken to prevent movement of the right hand end, by giving a direct pull down by using brazed steel inserts and screws, as discussed with blanking punches previously. The pilot hole has been utilised to take a dowel and provide a more positive location. Objection may be raised to the number of holes in this piece but it will be seen that the pilot hole is the only one required accurately, and so can be accommodated as the two blind holes are rough holes, the position of which is unimportant.

The steel block parting the two blanking positions, and thus cutting out the smaller wedges and separate recesses, has been

dowelled and bottoms in the recess to give accurate means of obtaining the progression. The rotor blanking position is dealt with in the same way as the stator position.

The piercing holes are dealt with as previously discussed, although our American friends have on occasion designed one large tungsten carbide bush in which are positioned the three small holes as in Fig. 11. However, as previously mentioned, this gives rise to pitch difficulties and excessive grinding, and also raises the need for a jig-grinder. The bush method eliminates this need, as the holes for the bushes can be jig-bored, and the bore of the bush ground concentric with the outside diameter.

From Fig. 11, showing the punch set, it will be noted that every precaution has been taken to strengthen the piercing punches which are piercing approximately 0.1 in. diameter. This has been done by increasing the diameter of the shanks as much as possible, by increasing the thickness of the punch plate, and by accurately guiding them in bushes in the stripper plate.

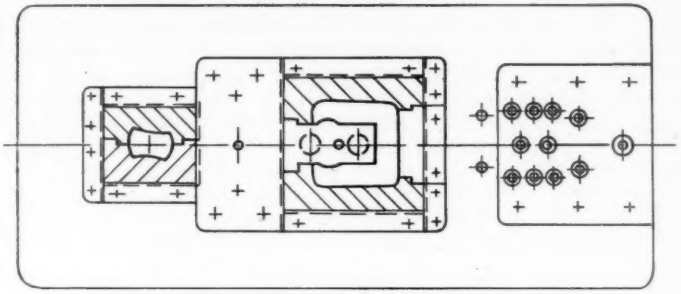
The stator punch has been designed for solid tungsten carbide with a rectangular shank and head, as it is of awkward section for the contemplation of a brazed tip. The rotor punch likewise is of solid tungsten carbide, with a round shank and head. This is located radially by means of tenon strips and flats. From Fig. 11 it can be seen that a pilot is necessary in the centre of this solid carbide punch ; this can easily be done, but the bore after offering a suitable length of guidance for the pilot should be relieved to eliminate internal grinding, which is slow and costly.

The form on the rotor punch is of irregular shape and thus will need to be form ground; this in turn is of some importance to design as the wheel runout has to be found, and due allowance taken for any washing out of the round shank in the punch plate.

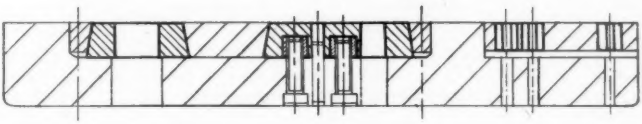
A few miscellaneous points to consider are as follows:—

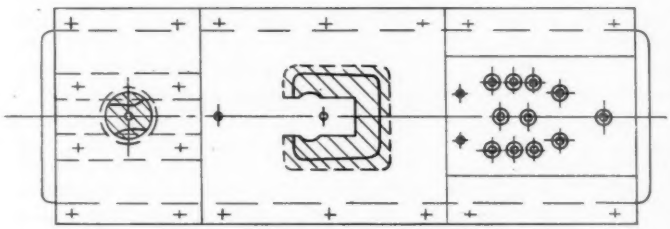
Clearance between die and punch. This is usually based on the standard figures for normal press tool practice, being for steel approximately 10 per cent. of the stock thickness. Of course, for .005 in. razor blade strip this becomes .0005 in., and is therefore .00025 in. a side, and being on fairly complicated forms demands extreme accuracy in manufacture.

Clearance in the die. This also is sometimes based on standard press tool practice, usually a straight angle, or a land and then a clearance angle. However, as this governs the life of the press tool somewhat, due to the increasing gap between punch and die on grinding down the die, it is of importance. This increased gap would soon give rise to unwanted burrs on the piece produced, and the press tool is then scrap, thereby wasting a certain amount of tungsten carbide. It would seem then that the practice of a straight land and clearance would prevail, but generally speaking



PLAN VIEW OF DIE BLOCK ONLY





PLAN VIEW OF PUNCH PLATE

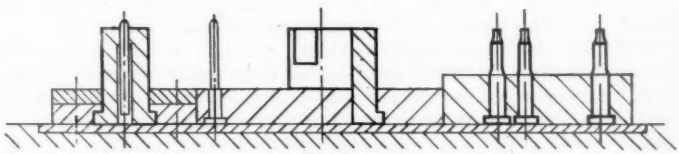


FIG. 11

this is not so for yet another reason, that of an increased operation in grinding the die blocks, which on a large and complicated form in tungsten carbide is of considerable moment. The usual practice, therefore, is a straight clearance aiming at as slow an angle as possible, but with no tendency to hold the piecings, and as such is in the order of .0015 in. per inch a side. Considering a die segment thickness of say ½ in., on grinding down half of this the increase in clearance between punch and die would amount to .00075 in. which is quite reasonable.

Pilots. The use of pilots, as is well known, is necessary on any multi-stage press tool to maintain accuracy, although they some-

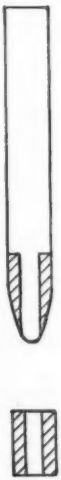


FIG. 12

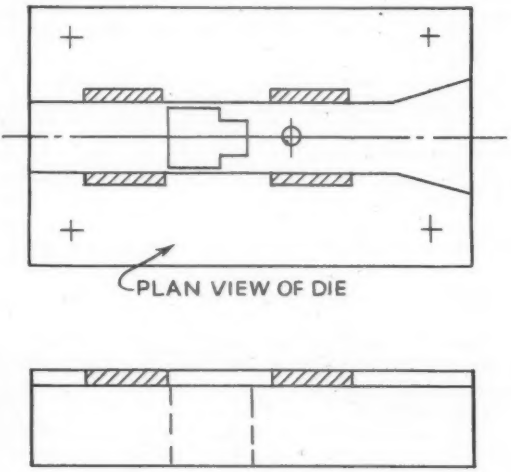


FIG. 13

times present certain difficulties in tungsten carbide press tools, such as demanding a hole through a weak sectioned punch. Therefore, wherever possible, they should be positioned outside the punches. The material of pilots is normally of high speed steel, due to the wear experienced on them, especially at large production rates, and thus the need for tipping them with tungsten carbide often arises. Unless absolutely necessary this should be considered an added refinement to be introduced at a later stage. The shape on the nose should be the same in either tungsten carbide or high speed steel, and when tipped a typical pilot would be as in Fig. 12.

On regrinding the face of the punches, the pilot will protrude more than necessary, and so a device for adjusting the pilot backwards will obviate any necessity to grind it.

Guide Plates. These are another minor issue worthy of some attention, especially if strip is brought in to a finished width, and forms need to be centrally placed. The gap between adjacent guide plates as in Fig. 13 is of some importance, and many consider tipping both guide plates with tungsten carbide, as shown, to lessen wear and resulting inaccuracy. A further precaution is sometimes followed of making one side fixed and the other spring loaded, thus providing extremely accurate location of the strip on the die surface.

Stripper Plate. The function of the stripper plate is firstly to strip the material from the punches on the up stroke, and secondly to help in guiding the punches. However, whether the stripper plate is fixed to the die section or punch section, spring loaded or not, does not materially affect the design of this when applying tungsten carbide. The point to bear in mind is that every opportunity should be taken to guide the punches at a point adjacent to the die aperture, ensuring an accurate line-up between punch and die. To this end, on any spring-loaded stripper plate the guide bushes, etc., should be extremely well made and of substantial nature. Small piercing punches are particularly weak, either in high speed steel or tungsten carbide, and most designers therefore incorporate hardened bushes in the stripper plate to ensure further accuracy. These bushes are very easily manufactured in tungsten carbide and when used are a step further in the search for the perfect punch/die line-up.

Pillars and Guide Bushes. As has been mentioned previously, these should be of a very substantial nature, and accurately manufactured, as the success or otherwise of any press tool is largely dependent upon them. The question of the number required then comes to mind, many present-day steel press tools having only two, but always bearing in mind that the application of tungsten carbide in any sphere of engineering demands ample support and a minimum of vibration, it is usually found desirable to use four pillars and guide bushes. Indeed, in some cases, particularly in the U.S.A., tungsten carbide is applied to the pillars and guide bushes to ensure lineability and to prevent wear. A typical method of applying this is shown in Fig. 14, from which it will be seen that the pillar has a number of tungsten carbide strips brazed to it, and the bush has a solid tungsten carbide ring brazed into one end. The use of four pillars, however, sometimes gives rise to regrinding problems on the die and punches, which is not met on two-pillar press tools—that of the size of grinding wheel necessary to clear the protruding pillars. This can be overcome by using a

separate die plate with some form of location, which can be removed from the die assembly, reground, and then replaced in the original position.

Corners. On designing a press tool to suit a particular form the

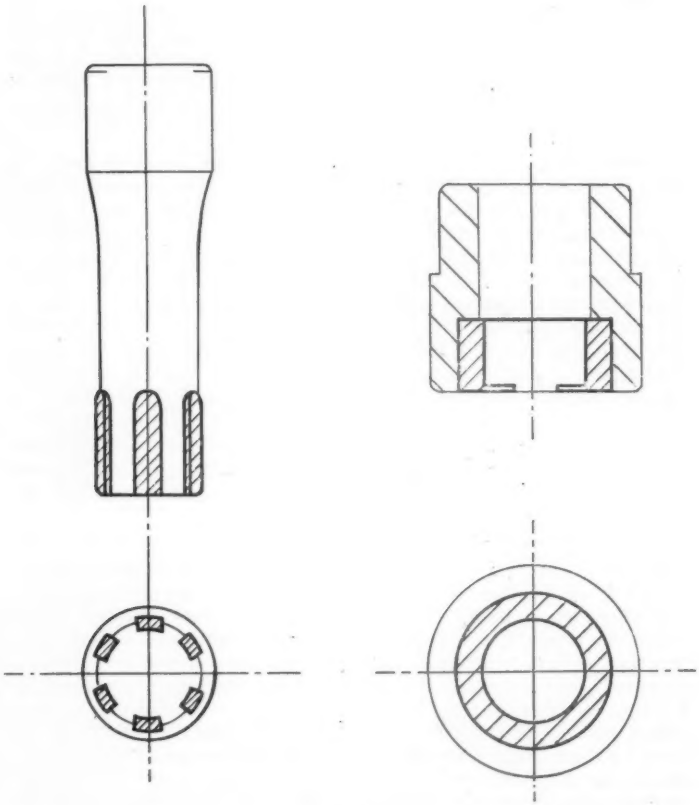


FIG. 14

question often arises as to the minimum radii obtainable in corners. Referring to Fig. 15, it will be seen that the best way to obtain a sharp corner in tungsten carbide die sections is to split the die at this point as at 'A'. It is, however, very difficult to achieve this in

corners as at ' B ' and a minimum of .003 in. is the usual amount, this being due to the inability to grind and maintain a sharp edge on the grinding wheels. Sharp corners can be obtained by other methods but are usually very laborious and costly.

Length of Punches. This is a general note on previous discussions to emphasise the need to keep punches as short as possible for

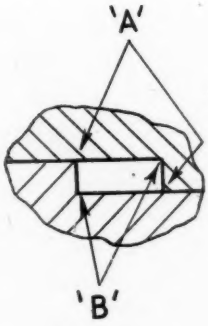


FIG. 15

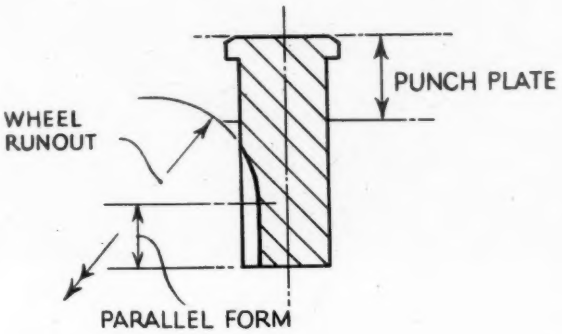


FIG. 16

maximum strength. Allied with this in respect to formed punches is the amount of wheel runout necessary, as the form would have to be ground on a form grinder. Therefore, the length will be to some extent influenced by this factor and may be found to equal a suitable length of parallel form, plus the wheel runout (4 in. diameter wheel) plus shank and head dimensions as at Fig. 16

Grades of tungsten carbide to use. This also is a general note, for information only, but in all cases the manufacturer's guidance should be taken. The main physical qualities that are required are resistance to shock and resistance to wear. As is generally known, the higher the percentage of cobalt the more the resistance to impact but the less to wear, while the lower the percentage of

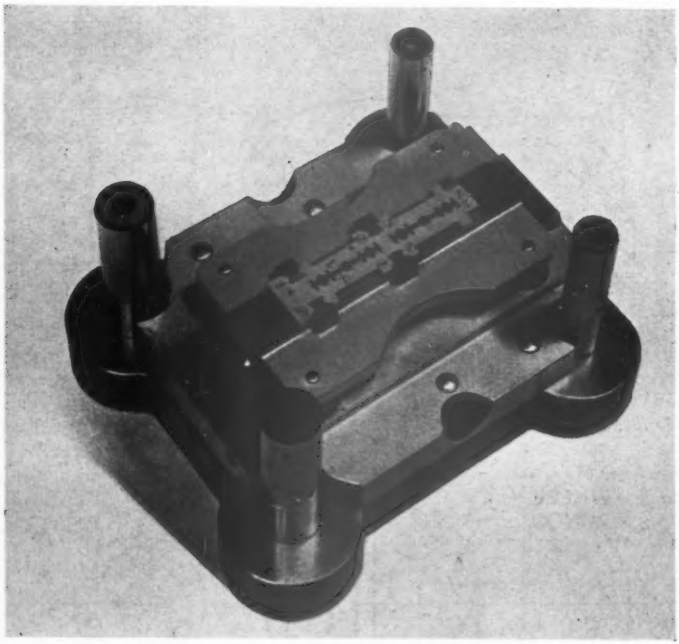


FIG. 17

cobalt the lower the resistance to impact and the higher the resistance to wear, therefore a grade to suit to a certain extent both requirements, is necessary. As a guide, the grade chosen is somewhat softer than the grades used for normal turning practice.

GENERAL APPLICATIONS Having now attained a working knowledge of the various principles, etc., involved in the application of tungsten carbide to press tools, the opportunity is

taken in this final section to discuss the various features both in design and application of a number of press tools in use at the present time.

RAZOR BLADE TOOLS The centre and side perforations in the typical razor blade provide a good opportunity, as previously mentioned, for the use of tungsten carbide. Strip is of

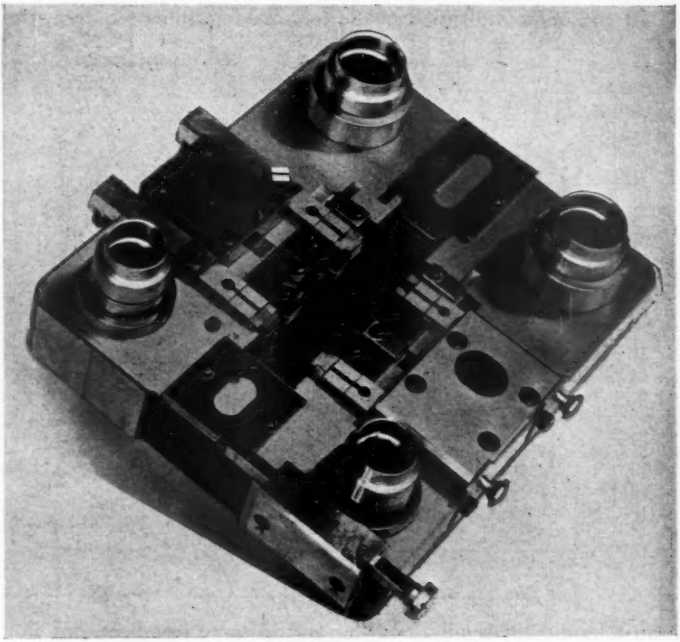


FIG. 17a

carbon steel and is supplied to finished width, usually about .88 in. by .005 in. thick, in coil form.

A typical form of razor blade tool is shown in Fig. 17, and a normal set of tungsten carbide punch and die segments in Fig. 17b.

Worth noting in the illustrations are the solid tungsten carbide die blocks, which are held mechanically and located by tenons. The centre form punch is of solid tungsten carbide and can be

supplied with the form running along its entire length or with a rectangular head, and usually has a clearance hole in the upper end for securing to the punch blocks with a screw. The notching punches are shown tipped, but more often than not are made solid and have on occasion been supplied with a central hole running for the full length to accommodate a spring plunger. The pilots in this case are also tipped with tungsten carbide, whilst fixed and spring loaded guide fingers utilise solid tungsten carbide blocks mechanically held.

To give some indication of the tool-making limits required, the

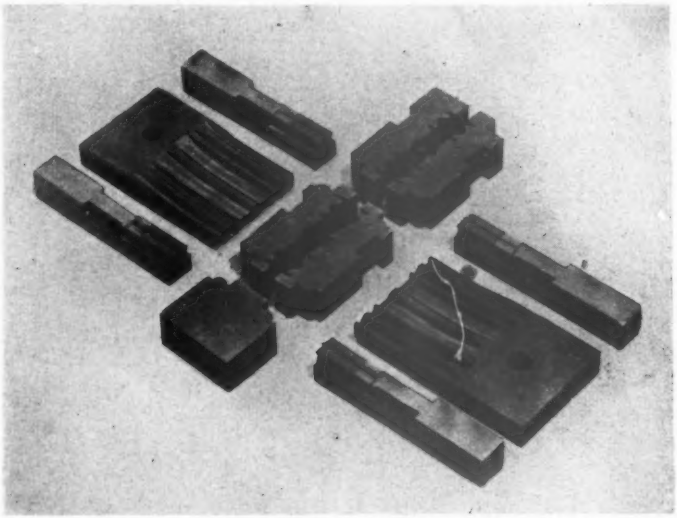


FIG. 17b

form tolerance is usually .002 in., and in some instances .001 in., whilst the punch has to clear the die form by approximately .0002/.0005 in. all round the form. To obtain this high degree of accuracy the forms are ground on an optical form grinder as close as possible, and finally lapped to remove high spots with the use of a light box on the projector.

As already mentioned, the clearance in the die, ignoring the fact that the blanks need to escape, is very critical and has to be kept to a minimum to ensure that when a number of regrinds has occurred the increase in punch to die clearance does not become prohibitive. This is particularly important in the razor blade industry, as burrs

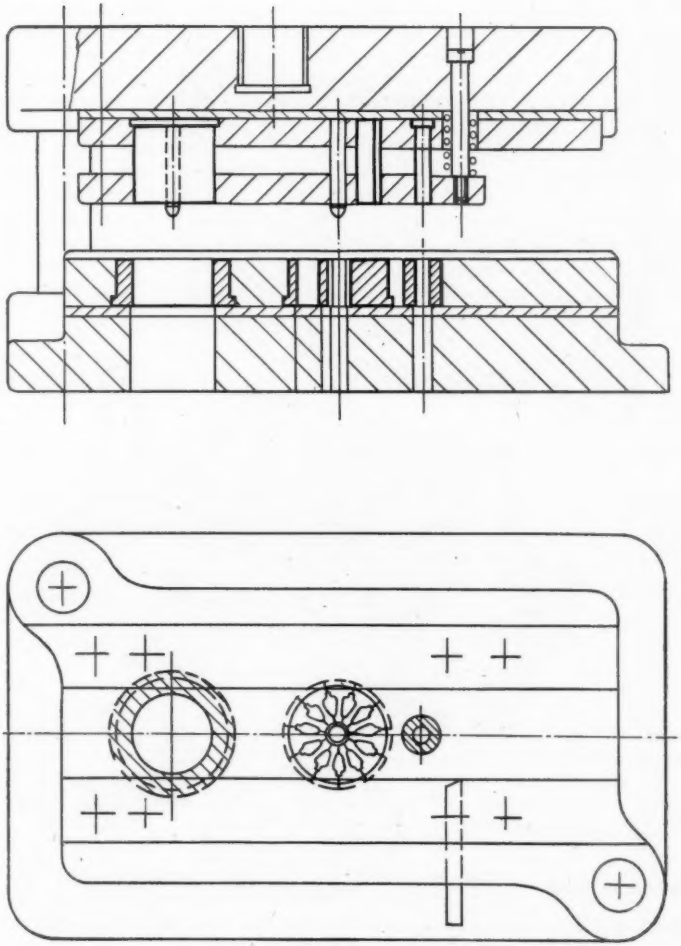


FIG. 18

on the component cannot be allowed due to subsequent grinding and the heat treatment operations.

It will be seen that with a clearance of .002 in. per inch a side, and with an initial clearance between punch and die of .0002 in., when having ground ¼ in. off the top face of the die, the die-to-punch clearance will have increased by .0007 in., this giving a reasonable life to the tool. This, however, can be overcome by suitably displaced angles to compensate for the amount that the punch-to-die clearance is increased after regrinding. Further, with care, and withdrawal of the press tools for regrinding at a time before the wear becomes too great, it will be found that it is only necessary to remove approximately .003 in., and thus eighty-five regrinds may be obtained as against .010 in. and twenty-five regrinds with normal steel tools. As mentioned previously, the application of tungsten carbide to this industry has brought considerable saving compared

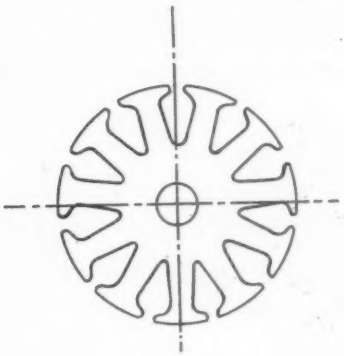


FIG. 19

with the use of steel tools ; incidentally, this is not taking into consideration the saving in breakdown times, etc.

In passing, mention can be made that tungsten carbide has also been successfully applied to rolls and slitting discs for production of the razor blade strip.

NOTCHING TOOLS A typical lamination required by the electrical industry, which is usually of approximately .02 in. thick stalloy and is as shown in Fig. 19, can be produced in three ways, either by a single notching tool, progressive tool or a compound tool.

The single notching tool is very common and is similar to that shown in Fig. 9, and whilst being very simple is also very reliable.

FIG. 20

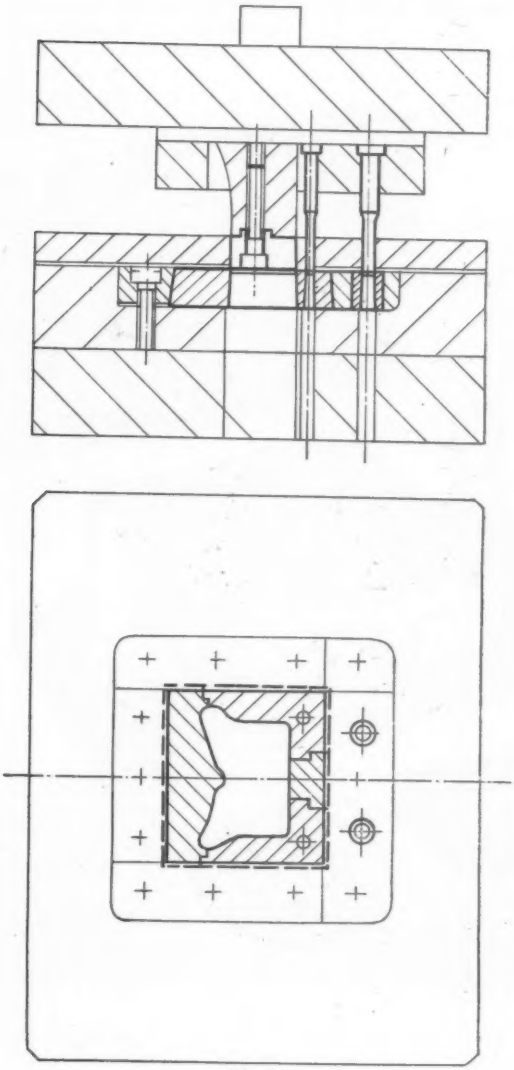


FIG. 21

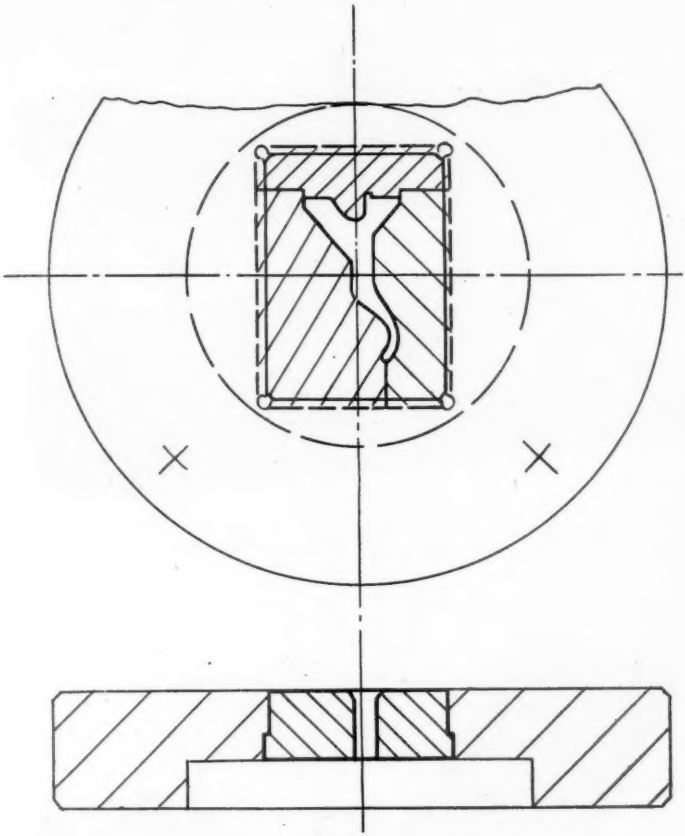


FIG. 21a

Although tools of this nature are relatively easy to manufacture, and cheap as compared with the progressive type, they have a big disadvantage in that they only produce one notch per blow, which necessitates a rotary fixture.

The progressive type of tool, however, will produce one complete lamination per blow of the press and can be designed to accommodate tungsten carbide, as shown in Fig. 18, the manufacture of which, as can be seen, will require a high degree of accuracy in grinding, assembly, etc.

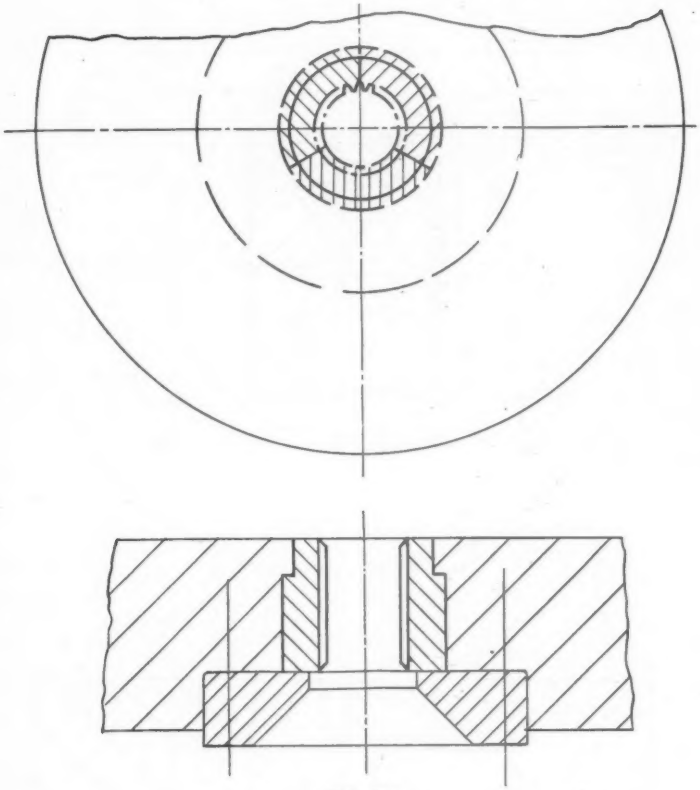


FIG. 22

It will be seen that solid tungsten carbide die segments are utilised in the first station, rotary ground on the inner and outer diameters after form grinding, and then the complete assembly is shrunk into a steel ring which is itself located in the main die plate. The inner faces of these segments are pushed against an inner die bush, which serves firstly as a location and secondly as a pilot position. The piercing punches are also solid tungsten carbide and are held in a similar manner to that of the die assembly. The blanking position follows normal practice, discussed earlier in this paper.

It will be realised that a compound tool for this component will be extremely complicated, the cost probably being prohibitive,

FIG. 23

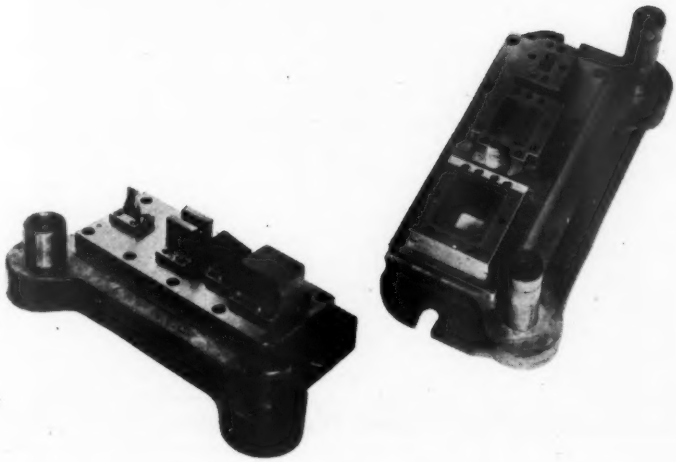


FIG. 23a

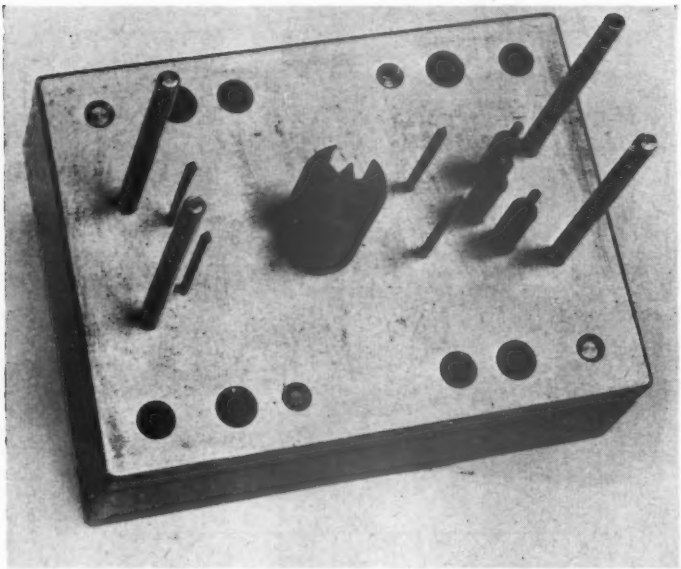


FIG. 24

although the tool shown in Fig. 20 has been produced in the U.S.A.

Tools of the single notch and progressive type regularly produce one million components per regrind, giving approximately ten to twenty times the life of steel tools. The same remarks with regard to life, regrinding, etc., mentioned when dealing with the razor blade tools, also apply.

TWO-STAGE PIERCING AND BLANKING TOOL

Due to the shape of component required, this tool provides a good example of design of a built up die as shown in Fig. 21. Form grinding requirements necessitated a split die of solid tungsten carbide segments, suitably tenoned and secured with wedges. To obviate redesigning as a three stage tool, due to the proximity of the smaller piercing holes to the main die form, these were incorporated in the solid tungsten carbide sections, care being taken to split the die between the holes whilst the larger piercing holes have been placed in the fixed wedge. The punch was too large to manufacture in solid tungsten carbide and was therefore tipped and held mechanically by means of two screws and a dowel in conjunction with a tenon. As the punch also accommodated two pilots, this

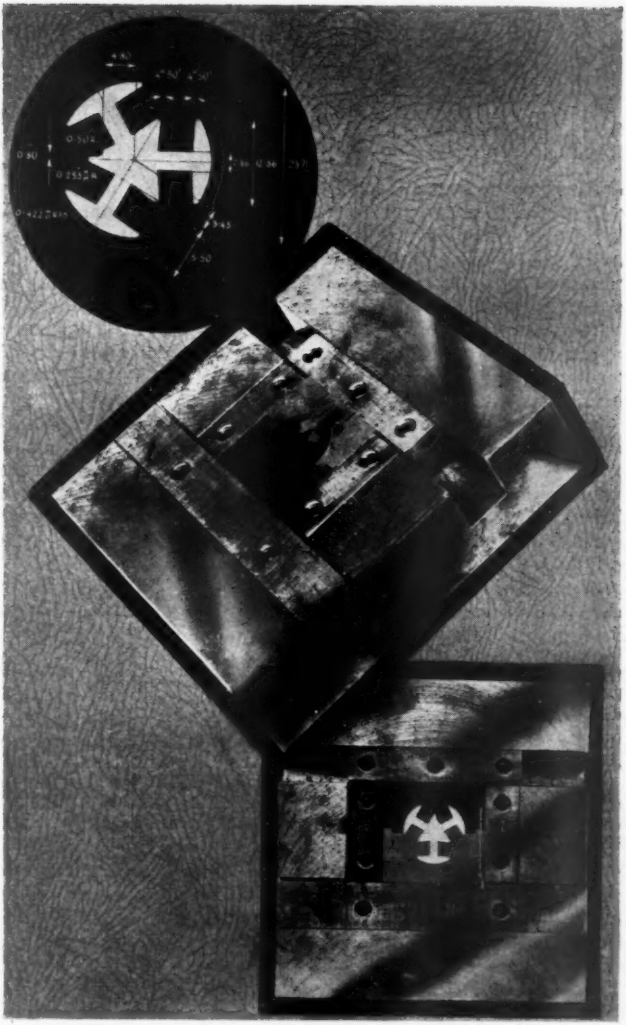


FIG. 24a

meant that the block required five holes in it, but as only two were required to be located accurately this was acceptable. This tool is now performing extremely satisfactorily on .016 in. thick spring steel.

TOOLS FOR POWDER METALLURGY

Dies for this industry, whilst not falling within the scope of this paper, provide good examples of the build up of tungsten carbide segments and the intricate forms which can be undertaken. Dies of this type are subjected to a large degree of wear due to the abrasive action of the powders being pressed, tungsten carbide dies giving a life ratio of 100 : 1 in actual production, over steel dies.

Similar types of tool are in use for the pressing of pre-sintered tungsten carbide tips in the early stage of their manufacture.

This type of work involves the same high degree of accuracy as do press tools, and so the same difficulties are encountered. Two typical outstanding applications, that of a formed trigger die and a gear die, are illustrated in Figs. 21A and 22 respectively.

The feature of the trigger die is the very intricate form required, necessitating the use of three segments split where shown, for ease of manufacture, the whole being assembled in a die case. The die aperture is required to limits of $\pm$.001 in. and should be lapped and polished. Only the die itself is shown in the illustration, being of the most interest. The component has twenty-two teeth and is $\frac{3}{4}$ in. diameter, with a tooth depth of approximately .06 in. The procedure adopted in the manufacture of this die is very similar to that of the previous form die, having three segments to facilitate form grinding with an indexing fixture.

THREE-STAGE PIERCING AND BLANKING TOOL

This tool as shown in Fig. 23 is being successfully employed in the production of transformer laminations. Due to the size and shape of the die required in this instance, it was decided to use punch and die segments of steel tipped with tungsten carbide.

SMALL ROTOR LAMINATION PRESS TOOL

As can be seen, the die shape required necessitates the use of six die pieces suitably tenoned together and held by wedges, as shown in Fig. 24. The punch is of solid tungsten carbide due to its complex shape and variety of section, the portion located in the punch plate being of circular shape located radially by tenons. The small piercing holes are dealt with by solid tungsten carbide bushes and punches in the normal manner.

CONCLUSION

From the foregoing it will be seen that the use of tungsten carbide in the press tool industry is now established, although many phases of development, etc., have yet to be passed. Various avenues of approach can be taken, one of

which is economically working the material in the production shops to its final shape, thus reducing the cost of production and the ultimate sales price. Education of the user is also in its infancy, and such subjects as usage and regrinding need to be " put over " to much the same extent as in the present-day mass production shops. Further advances in design should be undertaken in many directions, particularly that of small punches and dies, and methods of securing sections.

MEETING OF COUNCIL

Thursday, 8th November, 1951

The Second Meeting of Council in the 1951/52 Session was held at 36, Portman Square, London, W.1, on Thursday, 8th November, 1951. Mr. Walter C. Puckey, Chairman of Council, presided over an attendance of 39 members. Also present were Mr. S. Metcalfe, Chairman of the Yorkshire Graduate Section, and Mr. H. J. C. Weighell, Chairman of the Luton Graduate Section.

FINANCE The audited Accounts for the year ended 30th June, 1951, were placed before Council. The surplus of income over expenditure was higher than had been forecast, the actual figure being £2,759. Of this, Council decided to set aside £2,000 towards the cost of a new building.

Administrative expenses had been increased by about £2,500, of which approximately half was due to increased cost of living, and half to expansion of activities. Local Sections' expenditure was higher due to increases in their activities. The nett cost of producing the Journal had been reduced by about £1,000. Subscription income for the twelve months had increased by about £3,000, as a direct result of increased membership.

SPECIAL RESOLUTION A Resolution, moved by Mr. A. L. Stuchbery, to the effect that "the Finance & General Purposes Committee be given power to co-opt additional members so that the Committee would be free to get expert advice in whatever direction it was wanted, and so that the best interests of the Institution would be served," was carried unanimously.

JOINT CONFERENCE WITH THE B.I.M. The Secretary reported that this Conference had been highly successful and the general opinion of those attending was that it had met a definite need. Many expressions of appreciation had been received from those taking part. The possibility of holding similar conferences in different parts of the country was under review.

SECTION MEETING TICKETS Some discussion took place on the new arrangements for notifying members of Section Meetings. While attendances in some Sections had decreased, other Sections had maintained their average attendances and, in some cases, even increased it. It was decided to discuss this matter again at the next Council Meeting, when more information would be available.

SCHOFIELD TRAVEL SCHOLARSHIPS The number of entries for the 1952 Scholarships was again low ; on the other hand, the quality of applications appeared to be of a high order.

BOMBAY GRADUATE SECTION Council adopted unanimously a recommendation that a Graduate Section should be formed in Bombay, and were pleased to note the growth of this very active Section.

INTRODUCTION OF NEW MEMBERS Council adopted proposals from the Education and Membership Committees regarding the introduction of new members to Institution activities. These proposals were :—

(*a*) that Sections who so desire may present membership certificates to new and transferred members at special meetings ;

(*b*) that a member of each Section Committee should be responsible for looking after new members on their first attendance at Section Meetings ;

(*c*) that each newly-elected member should receive a letter of welcome from the Section President ;

(*d*) that the Section Committee member responsible for the introduction of new members should retain a synopsis of their applications, in order that he may be aware of their special interests when Working Groups are formed, or lecturers required for special subjects.

It was agreed that these recommendations should be put into operation for a trial period of twelve months. It was also agreed that Sections might vary these proposals at their own discretion, the object being to ensure that new members were given an opportunity of co-operating in Institution activities.

ASSOCIATE MEMBERSHIP The Council approved unanimously a recommendation from the Membership Committee that the Articles of Association should be amended in regard to Membership Applications from individuals over the age of 35. At present such individuals were not required to take the Associate Membership Examination, but might be asked to submit a thesis if Council were not satisfied with their technical attainments. The amendment would ensure that applicants who were otherwise acceptable to Council could be asked *either* to complete such parts or subjects of the Associate Membership Examination as Council might direct, *or* to submit a thesis on some aspect of Production Engineering.

JOURNAL Mr. L. Bunn, Chairman of the Technical and Publications Committee, stated that in view of the unavoidable increase in Journal printing costs, it might be necessary to reduce the size of the Journal for two or three issues during the current

Session. Nevertheless the Committee intended to make every effort to maintain the present standard.

Many expressions of appreciation had been received concerning the September and October issues which contained a full report of the Harrogate Conference.

In response to requests from the junior members of the Institution, a special section of the Journal was to be devoted to Graduate activities starting with the December, 1951, issue: this section would be entirely maintained by contributions from Graduate Sections, and would be dependent on suitable material being submitted by Graduate Sections.

RESEARCH The Joint Committee Report on "Measurement of Productivity—Applications and Limitations" had now been published and circulated to all Corporate Members of the Institution of Production Engineers and the Institute of Cost and Works Accountants. The Report had attracted an appreciable amount of publicity and outside sales had been considerable.

The Joint Committee were now discussing future projects which might be undertaken with benefit to both Associations.

Mr. B. H. Dyson, deputising for Sir Lionel Kearns, Chairman of the Research Committee, moved that approval be given to the reprinting of the Joint Committee Report by any foreign countries who wished to do so. This recommendation was adopted.

MATERIALS HANDLING The reconstituted Materials Handling Sub-Committee, under the Chairmanship of Mr. T. W. Elkington, had already started work on its first Memorandum. The Sub-Committee had also accepted, on behalf of the Institution, an invitation to organise a one-day National Conference on Materials Handling in June, 1952, in connection with the Mechanical Handling Exhibition at Olympia.

STANDARDISATION In order to encourage firms and all members to submit suggestions on standardisation, the Standards Committee had approached all firms affiliated to the Institution drawing attention to this important subject. Firms have been asked to consider the possibility of appointing an individual within their organisations to deal solely with standardisation problems, as this would be a practical method of making progress in this important field.

HAZLETON MEMORIAL LIBRARY The Library has continued to acquire books and pamphlets, chiefly through gifts, exchanges and review copies. The number of volumes is now approximately 2,000 and 120 periodicals are regularly received.

The Sub-Committee recorded its appreciation of the help rendered by members in the preparation of Abstracts, which form a valuable part of the Library service.

OBITUARIES The Chairman reported with deep regret the deaths of the following members: Alexander Brown, M.I.Prod.E., E. M. W. Boughton, M.I.Prod.E., W. H. Bruerton, M.I.Prod.E., W. Buchan, Grad.I.Prod.E., R. G. Gray, A.M.I.Prod.E., S. W. Lee, Int.A.M.I.Prod.E., V. D. Pavord, M.I.Prod.E., and A. H. Scott Watson, A.M.I.Prod.E.

DATE OF NEXT MEETING Thursday, 24th January, 1952, at 36, Portman Square, London, W.1, at 11 a.m.

ELECTION OF MEMBERS

The following were elected to Membership by Council :—

As Members :
J. M. Aiton, T. W. Armstrong, L. C. Clarkson, S. Jackson, E. W. Pickston, J. Smedley, D. T. Smith Rae, J. A. Stafford, C. M. Wailes, T. N. Woof.

As Associate Members :
K. C. Blackmore, J. A. Bryant, H. T. C. Calam, G. C. Clark, J. C. Collins, P. J. Corbett, E. J. Cruse, A. Dale, P. Daniel, D. L. Davies, E. Fletcher, J. Ford, J. C. Henry, D. M. F. Heymans, A. C. Higgs, S. R. Hill, H. Lawrence, D. W. Lindsay, C. K. Lochead, T. MacInerney, J. M. Pain, A. G. Pettit, W. F. Powell, A. E. Sendall, L. J. Snooke, G. Stedman, J. J. Swales, E. J. S. Thomas, F. Tucker, T. D. Turner, K. R. Van Kampen, G. Walkinshaw, C. C. Williams, G. E. Wilson.

As Associate :
F. P. Heard.

As Graduates :
D. E. Alexander, P. J. Atkinson, M. A. W. Berry, C. A. Green, C. Greenhalgh, D. J. James, R. J. James, A. R. Kapoor, A. D. Lane, F. G. Little, E. W. Loveland, R. E. J. Roberts, T. R. Scanlan, J. F. Seager, K. Singh, G. N. Smith, D. B. J. Thomas, H. J. Thomas, G. J. R. Wilkinson, A. L. Willett.

As Students :
G. H. Bonelle, S. Booth, P. Boyd, E. Brammer, A. G. Broom, V. K. Chadha, J. A. Combley, J. P. Dainty, D. G. Davies, T. H. Davies, J. W. Dingwall, E. Edwards, R. L. Greenbury, G. C. Hawthorn, J. V. Houghton, P. T. Hughes, T. Hughes, D. Huntley, R. A. T. Jones, M. A. Khan, A. C. Middleton, R. B. Myring, E. G. J. Newman, F. E. Newton, G. A. Osborne, S. A. Petch, S. A. Pett, M. E. Reynolds, D. Richmond, B. H. Roberts, R. T. Sails, S. T. Selvaratnam, B. N. Sen, R. P. Sinclair, K. J. Smith, D. M. Wright, P. M. Wood, W. Worthing.

Affiliated Firms :	Additional Affiliate Representative :
Albion Motors, Ltd.	... M. Beaton.
Thomas White & Sons, Ltd. ...	... S. Lister, T. Millar.
Affiliated Firms :	Change of Affiliate Representative :
Dodson & Barlow, Ltd.	... A. E. Fitton.
Delfos, Ltd.	... W. F. Prakel.
New Affiliated Firms :	Affiliate Representatives :
Shell-Mex & B.P., Ltd.	... W. J. S. Hunter, A. E. McAulay.
Coventry Climax Engines, Ltd. ...	... L. P. Lee, C. A. Minns.

REINSTATEMENT AS MEMBER :
E. J. Treasure.

TRANSFERS :

FROM ASSOCIATE MEMBER TO MEMBER :
F. Brauer, W. H. Brown, D. C. Collins, L. F. Eve, H. W. Hodson, J. A. Holmes, C. J. Linzell, O. J. B. Orwin, J. C. Snow, R. W. Tuck, S. Waugh, J. R. Widdowson.

FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER :
W. Boneham, C. J. Clark, G. F. Cole, P. Green, L. J. Hanson, P. L. Pocock, R. M. Reay, G. A. Rowley, E. S. Trickey.

FROM GRADUATE TO ASSOCIATE MEMBER :
W. H. Bone, D. B. Bridge, H. R. Carr, J. H. Faulkner, E. G. Kinnell, E. LeCheminant, T. M. Mobberley, R. G. Masters, W. G. Mitchell, J. Robinson, J. R. Swann, E. L. Talbot, L. Walker.

FROM STUDENT TO GRADUATE :
P. F. Clarke, H. T. Richards, J. D. Parson, M. H. Toms.

SUCCESSFUL CANDIDATES IN 1951 ASSOCIATE MEMBERSHIP EXAMINATION :
The following were elected to membership by Council :—

AS ASSOCIATE MEMBERS :
C. I. R. Bradley, F. W. Reed, D. N. Singh, R. E. Slaughter.

AS GRADUATES :
J. D. Evans, D. F. Fairweather, D. J. Foster, D. T. French, L. J. Houghton, H. E. Kitson, L. E. Overton, D. Pendleton, W. J. Spry, H. C. Stewart, H. Trubshaw, D. Waterhouse, R. M. Webb, D. G. Wiley.

TRANSFERS :

FROM STUDENT TO GRADUATE :
I. L. Bateman, L. T. Boyle, W. Calderbank, G. A. Dishman, E. J. Edwards, W. Edwards, D. Goold, J. E. Heape, R. L. Jopson, J. F. Leonard, E. J. Lownes, A. J. E. Maynard, P. W. Moles, D. F. Philpot, R. E. Plaster, S. Sundaram, A. H. J. Watts, R. C. Williams.

LOCAL SECTION REPORTS

Adelaide

Lecture Meetings

Regular Monthly Meetings have been held during the period under review, and these have been well attended.

Section Committee Meetings

Section Committee Meetings have been held once a month. All these meetings dealt with general business, and the last one also included a preparatory discussion for the first Annual General Meeting which is to be held on the 21st October, 1951. It was decided to extend the Committee for the new year to nine members, and nominations for this extension and for the election of officers for the new year have been called. The Committee Meetings were well attended, —the average attendance being six out of seven members.

Membership

Membership at present totals 29. Applications for membership forwarded to Head Office for consideration by Council number seven.

Progress of the Section

The progress of the Section is considered to be satisfactory by the Committee, whose members have given active and enthusiastic support to the activities of the Institution.

The Committee are looking forward to considerable expansion in all directions in the second year of the Section's activities.

Birmingham

Mr. W. J. Morgan, of the Machine Tool Trades Association, opened this Session's lecture programme with an address on "The Machine Tool Industry." Prior to this address, Mr. H. Burke gave to the first meeting a report on the Harrogate Conference. His effective description of many of the outstanding features of the Conference was appreciated by all present. The Section Committee were of the opinion that it was the most successful event yet organised by the Institution, and they congratulate all concerned with the arrangements.

The comprehensive lecture programme includes two joint meetings with the Institute of Cost and Works Accountants.

The Section is co-operating with Professor J. R. Immer on arrangements in connection with a Work Saving Week in November, and have transferred their normal lecture on 21st November to a Speech Hall of the Birmingham College of Technology, in order that 400 local executives may attend this meeting, being addressed by Professor J. R. Immer.

The Committee were gratified with the recognition given to the work of the Section Materials Handling Research Group, by the election of Mr. T. W. Elkington as Chairman of the Institution's Sub-Committee on Materials Handling.

The social programme commences on Saturday, 3rd November, with a Buffet Dance at the Grand Hotel. The Section Annual Dinner Dance will be held on 29th March, 1952.

Birmingham Graduate

Lecture Programme

The purpose of this report is to demonstrate how this Graduate Section has put into practice some of its considered opinions concerning the organisation of lectures.

The programme should have a general theme chosen with a bias to local, rather than national, interests. For 1951/52, the Committee are considering methods by which the time elapsing between the design of the prototype product and final production flowing off the line may be reduced.

The programme consists of a series of papers covering various aspects from "The Design of a Tractor with Special Reference to Designing for Production" to "The Design for Wrapping and Card-box Making Machinery." As far as possible, the lectures follow a logical order and the titles, though somewhat long, are all explicit descriptions of the particular subject. This is to ensure an interested audience.

It is advantageous to commence the programme with a film evening based on the general theme, to follow up with a first-class lecturer and to commence the new Session with a national celebrity. The papers by Graduate Members are spread over the year to ensure good attendances.

Technical Papers Sub-Committee

This Sub-Committee was formed some months ago to encourage and assist junior members to present papers to the Graduate Section. It has performed useful work since its inauguration under the terms of reference given below :—

(a) To assist Graduate and Student members in the preparation of technical papers for presentation as lectures (not to assist in the detailed preparation of writing matter).

(b) To formulate a programme policy for the next year but one, for submission to the General Committee.

(c) Revision of leaflet on advice to lecturers on the preparation of papers.

The Committee gives assistance both in the formulation and preparation of papers and practical help in the provision of visual aids, etc., and provides a trial

audience for inexperienced speakers. This policy has been publicised, and a number of members are being assisted at the present time.

In order to give some further initiative to Technical Writing, the Sub-Committee is awarding an annual prize for the best essay of 500 to 750 words which gives the critical discussion of any lecture or a technical survey of any visit within the year's session.

Publicity

Some guidance is sought on the extent to which non-members should be encouraged to attend functions, as it has been reported that young people, although qualified to join the Institution, do not apply, since they are welcomed to join in all the Institution's activities without obligation.

Social Committee

The Social Committee have two main aims for this next season :—

(a) To make this Graduate Section financially independent of outside assistance by building up a social fund of sufficient strength to meet all commitments.

(b) To get members mixing more freely at functions arranged for this purpose.

Impetus has been given to both these aims by the joint outings with Wolverhampton Graduate Section to the Festival of Britain and the Farnborough Air Display.

The date has been fixed for the next function which is to be a Christmas Dance at " The Mermaid," Stratford Road, on 17th December, 1951.

Bombay

Section Meetings were held in June, August and September, 1951, all of which were well attended.

As a result of a close investigation into the type of full Section Meeting which could be considered to have the maximum value and attraction for the largest number of Bombay members, an inauguration which has met with considerable success has been put into effect during this quarter. This has taken the form of considerably cutting down the number of meetings at which technical lectures should be given and substituting in their place full Section discussions upon technical subjects.

The first of these discussions was held at the Nineteenth Meeting of the Bombay Section on 3rd August, 1951, and dealt with the problems which are normally met in the day-to-day working of ferrous and non-ferrous foundries. The Meeting was an outstanding success and was attended by quite the largest gathering of Bombay members and guests which has yet been present at a Bombay Section Meeting. The problems which were put forward for discussion had first been submitted by a number of important foundrymen operating in the Bombay area. They were then closely screened by the Section Committee and the resultant agenda formed the basis of a wide and comprehensive discussion which was of such length and value that on the closing of the meeting, a number of the selected problems still remained to be dealt with, and it has been decided that these shall form the agenda for a further discussion meeting on a future date.

The experiment was repeated in September, when an equally successful discussion, based upon the subject " Materials Handling," took place. This discussion will form the basis of the Bombay Section's report to Headquarters on the subject of " Materials Handling," as, unfortunately, owing to many unavoidable circumstances, it has been impossible for the Sub-Committee, formed to draw up such a report some months ago, to get very far with its deliberations.

At a recent meeting of the Section Committee, a decision was made to form a Graduate Section, within the Bombay Section, under the guidance and leadership of S. G. Barbet, Esq., A.M.I.Prod.E. Mr. Barbet has also very kindly consented to organise courses of practical and theoretical training in Production Engineering

for the Student and Graduate members, and the value of such a procedure cannot be too highly stressed. At the time of writing this report, it is understood that the Finance and General Purposes Committee is to place its recommendation that a Graduate Section be formed in Bombay before the next meeting of Council for ratification, and subject to this being obtained, it is anticipated that no loss of time will be experienced in getting the Bombay Graduate Section into full swing. Certain difficulties will have to be overcome, in that a number of Student and Graduate members attached to the Bombay Section are resident some distance from the city itself, but all possible steps will be taken to overcome this problem.

In spite of the more stringent regulations now governing election to the Institution, applications for membership from suitable types of engineers are still being received at a most satisfactory rate. The Bombay Section rolls now contain the names of some 96 members of all grades, and it is anticipated that the century mark will be passed in the immediate future.

Calcutta

During September a most interesting film show and paper, entitled " The Age of Precision," were presented to this Section by Mr. H. W. Bramwell, A.M.I.Prod.E. The meeting was held in the Calcutta Technical School, and, in addition to Institution members, over 150 Students of the School were present.

During this quarter, 24 applications for membership have been received, of which 14 have been dealt with in Committee.

On the 1st August, a full Committee Meeting was held and a copy of the Minutes has already been forwarded to Headquarters.

Cornwall

During the last Session a total of four Section Meetings were held.

In October, 1950, Mr. F. W. Ross delivered his Presidential Address, the subject being " Training for the Job." Mr. Ross surveyed the difficulties encountered in the selection and training of Production Engineering craftsmen and administrators.

In November, 250 members and visitors were presented with a very interesting paper on " The Design and Development of the Twin Centaurus Engines of the Brabazon Aircraft " by Mr. J. L. Norton. This was illustrated by a film, and an enthusiastic discussion followed.

In an endeavour to introduce new blood into the activities of the Section, an invitation was extended to two young Associate Members to lecture at the March meeting. Mr. F. A. Cheshire dealt very ably with " Ball Bearing Production," outlining the manufacturing processes from forging to final inspection and assembly. An unusual subject in " Newspaper Production " was selected by Mr. F. G. Hawke who, after outlining the compilation of news all round the clock, revealed the intricacies of the Linotype machine, described the production of stereo plates, and their important role in modern rotary printing presses. Both lectures were illustrated by slides and sound films.

The Section was honoured in June by a visit from Sir John Cockcroft, C.B.E., M.A., F.R.S., who lectured on " The Application of Nuclear Power in Industry." About 350 people were present and Sir John answered innumerable questions to everyone's satisfaction.

The Annual General Meeting was held on 1st May, 1951, and the Honorary Secretary, Mr. F. W. Spencer, expressed a desire to retire from office. Mr. C. D. Alder paid tribute to the work done by Mr. Spencer for the Cornwall Section since 1946. Mr. F. G. Hawke was elected the new Honorary Secretary.

During the summer months, activity has been confined to the Section Committee. While appreciating the geographical position of the Section and the consequent difficulties in getting lecturers to travel long distances, the Committee have worked hard. The programme for 1951/52 is almost complete and a successful Session is anticipated.

The Opening Meeting of 1951/52 was held on 24th September at The School of Metalliferous Mining, Camborne. The Section was honoured by a visit from Mr. W. F. S. Woodford, the Secretary of the Institution, who addressed the meeting. Mr. Woodford outlined the history of the Institution and plans for its future development. This was the first time the Cornwall Section had commenced its winter activities in September, and although it clashed somewhat with the commencement of Evening Classes at The Cornwall Technical College, the gathering consisted of at least half of the members in Cornwall.

Coventry

Despite the incidence of holidays over practically the whole of the summer months, well attended Committee meetings have resulted in the preparation of a very full programme for the coming Session. Rugby members should be doubly pleased, as not only does the Section President, Mr. E. M. Price, hail from that town, but it is also the venue for a December and March lecture.

The first lecture this season, a joint discussion with the Institution of Mechanical Engineers, and, incidentally, one of three joint meetings, was well attended, and the introductory remarks on Design for Production by a member from each Institution were followed by the usual lively discussion.

Coventry Graduate

The activities of the Section during the past quarter have been confined to Committee Meetings, in which the Lecture Programme for the coming Session has been planned. The policy of the Section Committee is to encourage members to take an active part in Institution affairs. It is felt that Discussion and Study Groups, coupled with lectures and Paper evenings form a necessary part of the Graduate's training. The 1951/52 programme has been framed to provide this training.

The Douglas D. Davis award for the best paper submitted by a Coventry Section Graduate has been modified to be within the scope of all members of the Graduate Section. The new conditions allow for a short paper, the prize being awarded not only on subject matter, but presentation and delivery.

As a result of the successful Study Group formed last Session, a new group has been formed, and further groups are proposed for any members interested.

In order that personal contact can be made with fellow Students and Graduates, a number are being invited to each Committee Meeting, this method of approach proving very successful.

Dundee

Committee

Arrangements for the 1951/52 Section Programme were completed, and consist of lectures and Works Visits, one lecture being arranged for the neighbouring township of Arbroath, in an endeavour to extend knowledge of the Institution's activities beyond the city boundaries.

Six applications for membership and transfer were dealt with by the Committee, and the Honorary Secretary reports a further five forms sent out due to direct application.

Due to efforts by the Section President, Mr. A. R. Gow, and the Institution Education Officer, Mr. T. B. Worth, the Dundee Technical College Mechanical Engineering Department have offered a course on " Workshop Technoiogy," leading to the Ordinary National Certificate, and ultimately (next year, if possible) to a course in " Production Engineering."

General

A visit to B. X. Plastics, Dundee, was most capably handled by their Chief Engineer, Mr. J. Marshall, M.I.Plant.E. Mr. Marshall had arranged sufficient guides to allow of no more than two visitors per guide, thus ensuring a thorough

exposition of the factory and processes. These guides, from works staff, after completion of the tour and adjournment to the works canteen, were called upon to answer the many questions put to the Chair on a wide variety of technicalities.

At the first lecture meeting of the Session, held on 10th September, Dr. D. F. Galloway, Director of Research, P.E.R.A., delivered a most interesting lecture on "The Activities of the Production Engineering Research Association of Great Britain."

Eastern Counties

Local Activities

The lecture programme is complete. This includes the Annual Meeting in Colchester and two meetings in Norwich. The subjects chosen cover a wide field in Production Engineering, and should appeal to all members. On 9th November, the newly-elected President, Mr. A. H. Leggett, will deliver his Presidential Address on "The Growth of a Business."

Working Groups

Replies to the questionnaire circulated to local industrial concerns are being summarised, and case studies are being prepared on individual aspects of Materials Handling. Progress continues in all investigations.

Technical Papers and the Journal

Four lecturers for the 1951/52 programme have been approached to submit their papers to the Technical and Publications Committee for consideration, with a view to publication in the Journal.

Membership Growth

On 12th October, the Section is holding its first meeting in Norwich, when Mr. E. C. Gordon England will be the principal speaker. It is hoped that this meeting will lead to the formation of a Sub-Section in Norwich, and thus make a substantial contribution to the campaign to increase membership. Much preparatory work has been carried out in circularising local concerns and other interested parties, to ensure a successful meeting.

Education

Mr. L. R. Chandler, Principal of the Ipswich School of Technology, has been elected a member of the Section Committee, and it is hoped this appointment will further stimulate the interest of engineering students in the work of the Institution.

Glasgow

The Section Programme for Session 1951/52 has now been arranged. An evening during February will be devoted to reports and discussions on the business of the Harrogate Conference, led by members of the Section who attended.

The Institution was represented at a meeting to discuss a proposed Productivity Exhibition to be held in Glasgow under the auspices of the Scottish Board for Industry. An increase in productivity must come by the adoption of modern methods in industry and it has been suggested that an exhibition illustrative of new ideas in operation, as compared with the old, may help. This suggestion was not well received by the various organisations represented at the meeting, and it was unanimous that such an exhibition would not achieve its object. It was agreed, however, that if organised works visits could be arranged, these may prove to be a way of demonstrating new ideas and methods adopted in Scotland.

On the 20th September, members of the Section visited the Works of H. Morris & Co., Ltd., Glasgow, furniture manufacturers. The thirty members attending were shown the various manufacturing processes, which proved to be most interesting and instructive.

Leicester

The quarter under review has seen the completion of one Lecture Programme and the commencement of another. The 1950/51 Session ended with a highly interesting evening's visit to the local Telephone Exchange, when about twenty members and their wives were conducted on a tour by the Engineers-in-Charge.

The 1951/52 Session opened on a rather disheartening note, with an extremely low attendance at the first meeting. That this was due in some measure to the lack of publicity and the change in the system of notifying members seems to have been borne out by the large audience that attended at the second meeting (after this had been better publicised) to hear Professor John R. Immer divulge some of the " Secrets of Production " and to join in a most interesting discussion.

The Dinner Sub-Committee has been hard at work with their arrangements for the 23rd November, 1951, when the Section holds its Annual Dinner at the Grand Hotel. Dr. D. F. Galloway, M.I.Prod.E., Director of Research at P.E.R.A, is to be Guest of Honour this year, and a large attendance is expected.

Lincoln

Section Activities

Following the agreed policy of works visits for the summer programme, two such visits have been made during the quarter, the first being to the English Steel Corporation Ltd., of Sheffield, in June, which was attended by 45 members. In July, a visit was made to the Works of Appleby Frodingham Ltd., Scunthorpe, and 38 members attended. There was no meeting during August, due to the interruption caused by the Section Honorary Secretary's holidays. The September meeting was held at Marshall Sons & Co., Gainsborough. During August, members of the Nottingham Section visited the new mechanised foundry of Ruston & Hornsby, Ltd., and were met by members of the Lincoln Section, the arrangements for the visit being made through the Lincoln Section.

Membership

No members have been elected during the past quarter, but the Section has recently received advice from Gainsborough junior members recently elected that they have been told by Head Office that they will be attached to the Lincoln Section. Official confirmation of this intimation is awaited.

Four applications for membership have been dealt with by the Committee and submitted to the Membership Committee.

The main feature of the Membership Campaign is, of course, the meeting to be held at Scunthorpe, particulars of which were given in the last report. All arrangements have to be completed.

In connection with the recent visit to Frodingham, it was possible, during this visit, to obtain a good impression of the interest in the Institution of that Company, and it is confidently expected that with the contacts already established, following the November meeting, the Section should have very worthwhile results. In addition to the efforts in the Scunthorpe-Gainsborough area, the Section is now turning its attention to the Southern boundary, i.e., Stamford. Reception is reasonably encouraging, and there is a limited support at local meetings. It is proposed, when preparing the programme for next year, to endeavour to incorporate a visit to Stamford on the lines of the Scunthorpe meeting arranged for November.

Liverpool

The first meeting of the Session proved to be very successful, with an attendance of about eighty members and visitors. The programme of films, which included " To be a Toolmaker "—a film on vocational guidance, was very well received.

On 26th September, the panels dealing with " The Economic Use of Materials," which were displayed at the Institution's Harrogate Conference, were shown at

the Exchange Hotel, Liverpool, to a number of leading Merseyside and Cheshire industrialists. The panels provoked a very lively discussion, both at the afternoon and evening sessions, and many constructive criticisms were offered on the subject. It is hoped to obtain the co-operation of industrialists in the area in the provision of material for the section paper on 20th February, 1952.

The Section Research Committee, at its meeting on the 19th September, decided that :—

The two main subjects of " Materials Handling " and " Work Measurement " must be considered together and the approach must be on a broader basis than hitherto. The practical aspects of any suggestions must take into consideration the labour situation ; the small firm ; industry's general lack of interest and the scarcity of trained personnel to implement recommendations which may be adopted. Industry should be encouraged to adopt an analytical approach to their problems and to study the difficulties, apparently not solvable at local department level, by reducing them to units where scientific investigation is possible.

Liverpool Graduate

The Session opened in September with a talk on " Television " and the opening of Holme Moss by Mr. R. C. Whitehead. An interesting evening ensued. The remainder of the programme covers a wide range of interesting subjects and concludes with a visit to the Shell Refinery at Ellesmere Port.

London

Naturally this quarter, covering as it does a large part of the holiday season, is comparatively quiet.

During the final weeks of the quarter, the arrangements for the 1951/52 Annual Dinner were completed and this event is to be held on Wednesday, 20th February, 1952, at the Connaught Rooms. Following the example of last year, this dinner will be an all-male function.

An important change has taken place in the London Section, in that the Reading Sub-Section has been awarded full Section status. This new Section is now standing unaided, and it has the good wishes of the members of the London Section for its success.

Lecture meetings of the Section and the South Essex Sub-Section do not commence until next quarter, but the Rochester Sub-Section opened its Session on the 13th September, when Mr. B. Holloway, M.I.Prod.E., gave a lecture on " Efficient Tooling for Production."

During the quarter, requests have been made by various organisations for the Section to provide lecturers, and these requests have been met.

South Essex

Meetings

No meetings have been held since the last Report, but two Works Visits were organised, one to Plessey & Co., Ltd., and the other to the Ford Motor Company. Nineteen members attended the former and fourteen the latter.

Programme for 1951/52

The Programme for 1951/52 has now been arranged, and the first meeting will be held on the 3rd October at the South Essex Technical College, when Mr. Lewis C. Ord will give a paper.

There will be three meetings in Chelmsford and three subsequent meetings in Ilford.

The possibility of organising an outing to the Austin Motor Company is being explored and it is possible that this may take place in November.

Luton

The first lecture of the new session was held on Tuesday, 25th September, 1951, given by Mr. G. W. Trobridge, B.Sc., on " Some Applications of Rubber in Engineering," and was the first of the season's papers on the subject of the Economic Use of Materials by Chipless Forming.

A joint meeting has been arranged between the Section and the Luton Management Association to be held in November, 1951, on " Packaging for Light Industry."

The Section President and a Graduate Member are away on a six weeks' visit to America.

Applications for membership are still far below the average and will be the subject for discussion at the next meeting of the Committee.

Manchester

Local Activities

The Winter Syllabus commenced well, with the stimulating and provocative paper from Mr. E. C. Gordon England, entitled " We Must Do Better." The paper is directed to all members of the Institution, and this led to a lively discussion.

The new Section President, Mr. R. H. S. Turner, is encouraging the Graduates of the Section to submit more papers for the various awards and the Schofield Travel Scholarship. At the last Committee Meeting, he advised the Graduate Section Honorary Secretary of his willingness to offer a Section President's prize.

Membership Growth

As is quite usual, there has been a decrease in the rate of growth during the summer months.

Stoke-on-Trent

During the period under review, Section activities have been confined to meetings of the Section Committee, and details of some of the main items discussed are listed below :—

(*a*) *Journal*

A fair amount of time was spent on suggestions for *Journal* improvement. It was agreed that the *size* should be as at present. The *contents* should also contain good editorial comment, correspondence from members, and name, business and firm of newly-elected members.

(*b*) *Lecture Programme*

The proposed lecturers for the 1951/52 Session were selected.

(*c*) *Committee*

The congratulations of the Committee members to Mr. Watkinson, upon his new appointment, were mingled with regret at the necessity of his resignation from the Committee, due to the transfer of district.

Melbourne

June Meeting

Before an audience of 70 people, Mr. D. Broadly, Metallurgist of Metalex Pty., Ltd., delivered a lecture entitled " Extrusions of Brass Rod and Sections." Mr. Broadly gave his address with an expert knowledge of his subject, the illustrations being lucid and well executed.

Works Visit

A most interesting visit was paid to the Sutton Tool and Gauge Co., Pty., Ltd., Factory at Northcote, Melbourne, on 27th June.

July Meeting

An address of great interest to members was given by two executives of the General Motors—Holden Ltd., Organisation, on 18th July. The subject was "The Philosophy and Economics of Modern Mass Production," and was ably delivered by Mr. Wallace-Crabbe and Mr. Donald D. Webster. At this meeting, well over 100 members and visitors were in attendance.

Defence Research Laboratories Visit

A visit by members to the Defence Research Laboratories, Maribyrnong, on 5th September, was a highlight which was greatly appreciated.

Members were greatly impressed by the activities of the various sections and appreciative of the help which the Scientific Officer can give to the Production Engineer in his aim for greater productivity.

North Eastern

The 1951/52 Session has now officially started and the President gave his Address on the 17th September, 1951. It was pleasing to note that there were 62 people in attendance and the Address was very well received. A full range of papers bearing more on the practical aspect of Production Engineering have been arranged for the Session.

Mr. J. S. Elliott is now Section Vice-President and Chairman for 1952/53.

In an effort to bring members of the Section closer together, the meetings have been prefaced by a tea, and it is hoped that this will eventually be a resounding success.

Arrangements have been made for a post-graduate course in Production Engineering at the University. This is open to graduates and holders of Higher Certificates in either Mechanical or Electrical Engineering.

North Eastern Graduate

The opening meeting of this Session was an address called "Some Applications of Compressed Air in Engineering," by Mr. G. D. Robinson, Grad.I.Prod.E., Chairman of the Graduate Section. This address was extremely good, and was illustrated by slides kindly loaned by C. A. Parsons, Ltd.

The Committee have met on several occasions recently, to decide and arrange the final programme for 1951/52.

Nottingham

The summer programme has included visits to Ruston & Hornsby, Ltd., Lincoln, and the new electricity generating station at Staythorpe.

Owing to the up-grading of Derby to full Section status, the total number of members now in the Nottingham Section has decreased. Efforts are being made to recruit suitable engineers to make good this loss, and appreciation is extended to Headquarters for their valued assistance in this matter. There is every indication that these joint efforts will bear much fruit in the weeks that lie ahead.

A promising programme has been arranged for the winter months, which it is hoped will attract new as well as regular members.

Preston

General

Activity during the past quarter has been confined chiefly to Committee meetings and final arrangements for the winter programme. Due to the calls of his business, Mr. Kemp has been obliged to lay down the Secretarial pen, and Captain H. Corthorn has taken over the duties of Section Honorary Secretary. Mr. Kemp, a stalwart of the Section, remains a regular attender at Committee Meetings.

Winter Programme

A varied programme has been arranged, and in addition to the usual six lecture meetings, there is an "open night" planned for April. This winter, all lectures are being held in hotels in place of the usual technical colleges, and it is hoped that this will increase attendances. This year, the Section is being honoured by a lecture from Dr. Galloway—the first lecture to be given to the Section this session.

Membership

The numbers continue to remain well above the 200 mark and increase steadily. The increase has been chiefly in the number of Graduates.

Sheffield

Local Activities

A number of the leading figures in the Engineering and Steel Industries of the Area have been invited to attend the opening meeting for the season, and they will be entertained later by the Section Committee. It is hoped to expand the interest in the Institution's activities at this level.

Education

A new Production Engineering subject is being discussed for introduction into the National Certificate Course, namely "The Technology of Steel Production." This is a subject considered to be of vital interest in this area. Rotherham Technical College is preparing a syllabus in conjunction with the local steel interests.

A course on "Steelworks Lubrication" is also being set up at Rotherham Technical College, where a course of lectures on "Materials Handling" has now commenced, although difficulties have been found in providing competent lecturers on this subject.

South Africa

During the period under review, two papers have been given to the Section, the first on 5th July, by Mr. C. S. Lindskog, on "The Oil Injection Mounting for Fitted Parts Requiring Interference," and the second on the 6th September, by Mr. T. D. Davidson, entitled "Cost Accounting."

In August, 1951, the fourth Annual General Meeting of the South African Branch was held in the Private Dining Room, Hotel Victoria, Johannesburg. Some 75 members and guests attended this function. The new office bearers of the South African Sub-Council for the 1951/52 period were elected at this meeting.

Southern

Following the suggestion arising from the Section Honorary Secretaries' Conference, to make the meeting place more attractive, the Section has now changed its meeting place to Southampton's leading hotel. This is following the experiment of last year when Lecture Meetings were transferred.

In August, an instructive visit was paid to the British Railway Carriage Works at Eastleigh. A visit was paid to the *Edinburgh Castle* in Southampton Docks on 12th September, and to The Princess Flying Boat and Saunders Roe, Cowes, Isle of Wight.

The Section Committee Meetings recommenced on 31st August, when Mr. F. C. Cooke gave the Committee members a review of the Harrogate Conference.

The opening lecture for the Winter Session will be held on 11th October, and will be given by Mr. J. A. Grainger on "Press Tools."

South Wales and Monmouthshire

The Section has been in recess since last April, with the exception of Committee Meetings. A comprehensive syllabus has been completed for the 1951/52 Session.

The response from members to start a Discussion Group was encouraging and a meeting was arranged for 11th October, 1951. Members can help in solving mutual problems, investigate difficulties and discuss subjects which will be of common interest. The meetings will be informal and will probably be held in offices, staff rooms, or canteens of works. It is hoped, in this way, that the discussions will be of assistance to members in the area.

West Wales

Accepting a warm invitation extended by Fisher & Ludlow, Ltd., a party travelled by road to visit that firm's Castle Bromwich Works on 30th August. The mechanical handling equipment in operation was very fascinating and the visit proved to be most instructive and enlightening. The Sub-Section is greatly indebted to Fisher & Ludlow, Ltd., for their hospitality.

Official permission has now been obtained from the Steel Company of Wales, Ltd., for a group to visit their Abbey Works, Margam, on 24th October of this year, followed by a visit to their Trostre Works on 24th April, 1952. These visits will undoubtedly prove most interesting and it is hoped that members will derive full benefit from them. (See Institution Notes, this issue).

The Section Programme has now been arranged, and includes papers on a wide variety of subjects.

It is noted with satisfaction that at Swansea Technical College there has been a marked increase in the enrolments for the subjects leading to a Higher National Certificate in Production Engineering. It is hoped that this will eventually lead to the formation of a virile Graduate Section in this area.

The Committee has also decided that the time has now come to launch a new recruiting campaign and suitable ways and means are under consideration.

Sydney

Local Activities

Three very interesting meetings were held in the months of July, August and September, and the attendances at all meetings were exceptionally good. On the 3rd July, Mr. R. V. Wood, M.I.Prod.E., presented a paper entitled "Rolling and Extrusion of Non-Ferrous Metals." On 7th August, Mr. C. A. Gladman, M.I.Prod.E., presented a paper entitled "The Basic Features of Production Engineering." Mr. Gladman, in this paper, brought to the Section's notice once more the ever increasing need for the use of basic engineering standards. On 4th September, Messrs. R. A. Barter, M.I.Prod.E., of Howard Auto Cultivators Ltd., M. Dixon, of British Standard Machinery Ltd., and P. Cottrell, Grad.I.Prod.E., of the Lithgow Small Arms Factory, presented three interesting papers based on the experiences with Tungsten Carbides in their respective plants.

On 14th August, a group of members made a visit to Port Kembla, which is approximately sixty miles south of Sydney, and during the morning, a visit of inspection was made of the Australian Iron and Steel Ltd., and in the afternoon the party visited the Lysaghts Works Pty., Ltd.

Research and Working Groups

For some months now, discussion has taken place at the Sydney Section Committee Meetings on the subject of inaugurating a working group, but it was not until Mr. C. A. Gladman delivered his paper on 7th August that a suitable subject was decided on for a working group. In his paper, Mr. Gladman revealed that there were many firms who appeared to be reluctant to use the basic engineering standards in their drawing office practice. The Sydney Section Committee

decided that a Working Group should be set up to consider the use of basic engineering standards in drawing office practice. A Working Group has now been established under the Chairmanship of Mr. C. S. Curtis, M.I.Prod.E., and it is hoped that some valuable work will result.

Membership Growth

The strength of the Section Membership at present totals 192.

Western

Social

The Section's Winter Session started with the Annual Dinner and Dance which was held in September. The evening was a great success and quite up to the usual standard. The Section was delighted to be honoured once again with a visit from the President, and also the Lord Mayor, Lady Mayoress, the Sheriff and his Lady. As a means of creating some entertainment for those not wishing to dance, a cabaret was introduced which proved to be very popular.

Graduate Section

The inaugural meeting of the Graduate Section was held on 1st October, when some 60 members were present, including Mr. F. Whitehead, the first President of the Western Section, and Mr. J. S. Daniels, a Past President who still continues to be very active in the affairs of the Institution. The Section was given a very good send off, and it is hoped that it will become a strong Section in the Institution. The first Chairman is Mr. R. W. Wall, Stud.I.Prod.E., and the Section Honorary Secretary is Mr. C. H. Spearing, Grad.I.Prod.E.

In opening the meeting, the Section President gave a brief history of the Institution and, in particular, the Western Section, and said that he was expecting big things of the Graduate Section. In any event, they could be sure of the full support of the Senior Section.

Mr. Worth also gave a short talk to those present, in which he stressed not only the value of education but also the increasing opportunities which were now being made available to younger members.

Lectures

The first lecture was held on 16th October, when Mr. Desmond discussed some of the aspects of the survey which he carried out recently on " Work Measurement."

Wolverhampton

The Wolverhampton Section wish to record that a Diploma Course in Production Engineering has been arranged at the Wolverhampton Technical College, and feel sure that this development will be of great assistance to many students in the district and to the Institution as a whole.

It is with regret that the death of Mr. W. H. Bruerton, M.I.Prod.E., is recorded. Mr. Bruerton was one of the oldest members of the Section, who had very ably served on the Committee for a number of years.

The Winter Session will open with an address given by Mr. H. R. Wilkins, Joint Managing Director of Wilkins & Mitchell, Ltd. Mr. Wilkins is one of the prominent local industrialists who has travelled greatly, and the title of his address will be " Travelling for Business."

On 14th July, a very interesting outing was organised to Malvern College and all taking part thoroughly enjoyed the visit.

Wolverhampton Graduate

During this quarter, July and August are usually quiet months from the Section activities viewpoint, and the Section Committee are generally completing Lecture and Visit Programmes.

The Lecture Programme Session has now been completed for 1951/52. Works Visits have also been fixed for the same period.

The Working Group finished its session in July and the data collected is now being compiled into a detailed report.

The Session commenced in September, the first lecture being " The Use of Rubber as an Engineering Material," by Mr. G. W. Trobridge, B.Sc.

A joint Social Outing was held in September, with the Graduates and friends of the Wolverhampton and Birmingham Sections, who travelled by coach to the Society of British Aircraft Constructors Exhibition and Flying Display at Farnborough. The party comprised 66 persons.

On 26th September, a Works Visit took place to Singer Motors, Birmingham.

The Section Committee have also arranged an Autumn Dance to take place on Friday evening, 16th November, 1951, at the Star & Garter Hotel, Wolverhampton.

Yorkshire

During the summer months the Section's activities have been confined to golf. The Annual Competition for T'owd Tin Pot was held at Otley, and was won by Mr. J. Horn, a Past President of the Section.

The annual match with the Leeds Association of Engineers was held at Sandmoor Golf Club, and the L.A.E. again won the Trophy, presented last year by Mr. W. Armstrong.

The serious side of the activities of the Section have now commenced and on Wednesday, 26th September, 1951, the Section helped in the organisation of a conference sponsored by the Institution of Electrical Engineers, with the Institute of Welding and the Leeds Chamber of Commerce. The Conference was held at the Leeds University and was entitled " Electricity as an Aid to Productivity," and the interest was chiefly in the subject " Motive Power in the Factory." Two members of the Section Committee, Mr. C. W. Mustill and Mr. R. S. Shilton, made valuable contributions to the discussion.

A letter has been sent, by the President, to all members of the Graduate Section, bringing to their attention the details regarding the Schofield Travel Scholarship and inviting them to submit papers.

The President has also sent a letter to all members of the Yorkshire Section, giving details of the season's programme, and asking for their support at Section meetings.

The first meeting of the Section is on Monday, 8th October, 1951, when Mr. E. G. Taylor, a member of the Materials Handling Productivity Team, will present a paper entitled " Some Aspects of Materials Handling in Industry in the U.S.A." A Works Visit to W. T. Avery, Ltd., Sherburn-in-Elmet, in connection with this paper, will take place on Wednesday, 10th October, 1951.

INSTITUTION AWARDS

Lord Austin Prize

This prize consisting of books and/or instruments together with a certificate, is presented annually for the best Essay submitted by a Graduate of the Institution. Details of conditions are published in the Journal each year.

Hutchinson Memorial Medal

A medal is awarded annually for the best paper presented to a Section by a Graduate of the Institution.

Institution Medals

Silver medals are awarded each year for the best paper presented to a Section during the year by (a) a member, and (b) a non-member.

Schofield Travel Scholarships

The Scholarships provide for two Graduates each year to spend six months on industrial study visits in selected overseas countries. Details and conditions of the Award are published each year in the Institution's Journal.

ANGLO-AMERICAN COUNCIL ON PRODUCTIVITY

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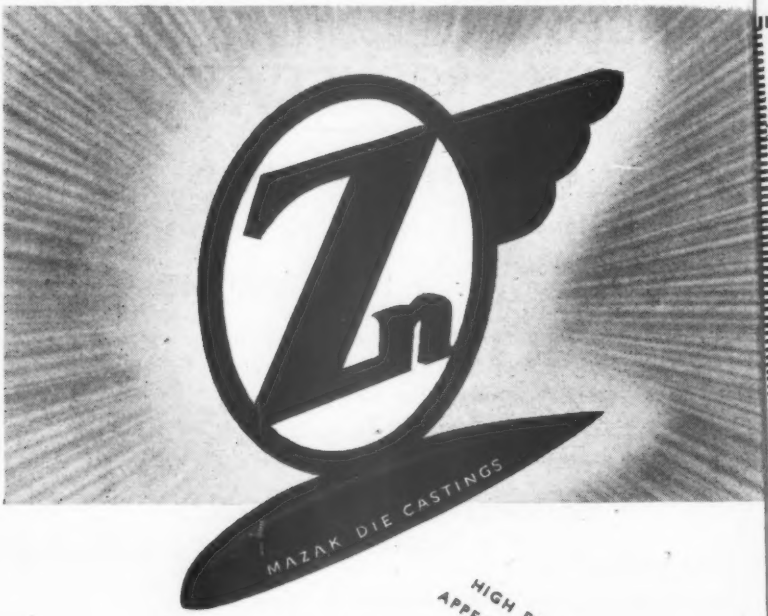

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By the elimination of hand finishing, the new Roto-Finish method of barrelling steps up production and often cuts finishing costs by as much as 50-80%.

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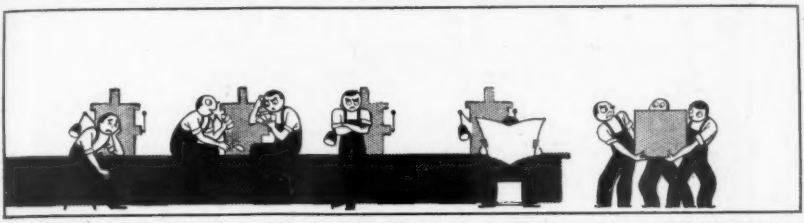
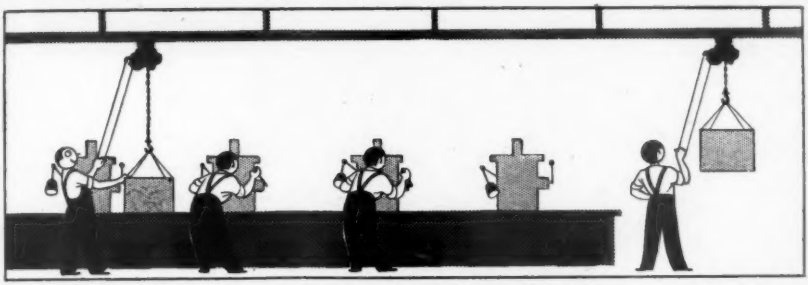


HOLD-UPS *like these hold down your profits and send up your costs. There's no primrose path to prosperity, but wise use of modern handling aids certainly smooths the way.*



NO WAITING NOW! *Look what happens when the production flow is rationalised. Everybody benefits—workers, managers, shareholders, consumers. Find out what the My-Te-Min can do for you!*

You might have a shock if you worked out how much of every £1 you pay in wages goes into unproductive lifting and shifting. Many a modern materials handling system has paid for itself in a single year's savings. You know what modern handling methods can do, but perhaps feel your problem is 'different.' You will find in KING booklets details of made-to-measure installations ranging from a single electric pulley block to comprehensive layouts of Overhead Runways, Travelling Cranes, Floor Conveyers. Look into this; there is no obligation except ours—to help you speed output and lower costs.

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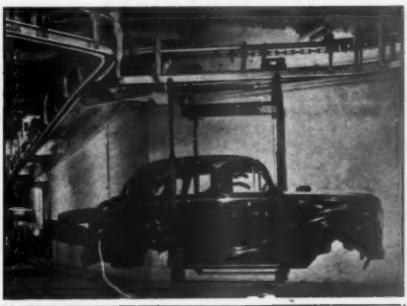

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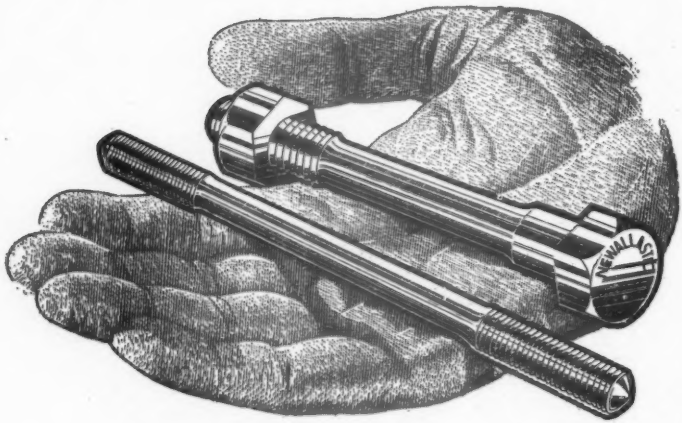

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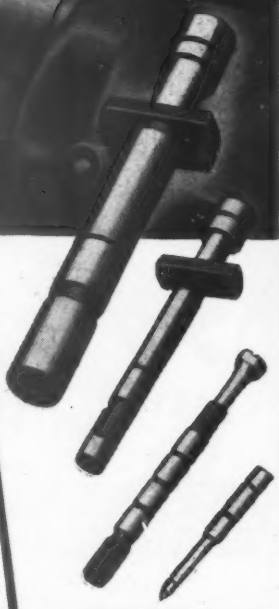

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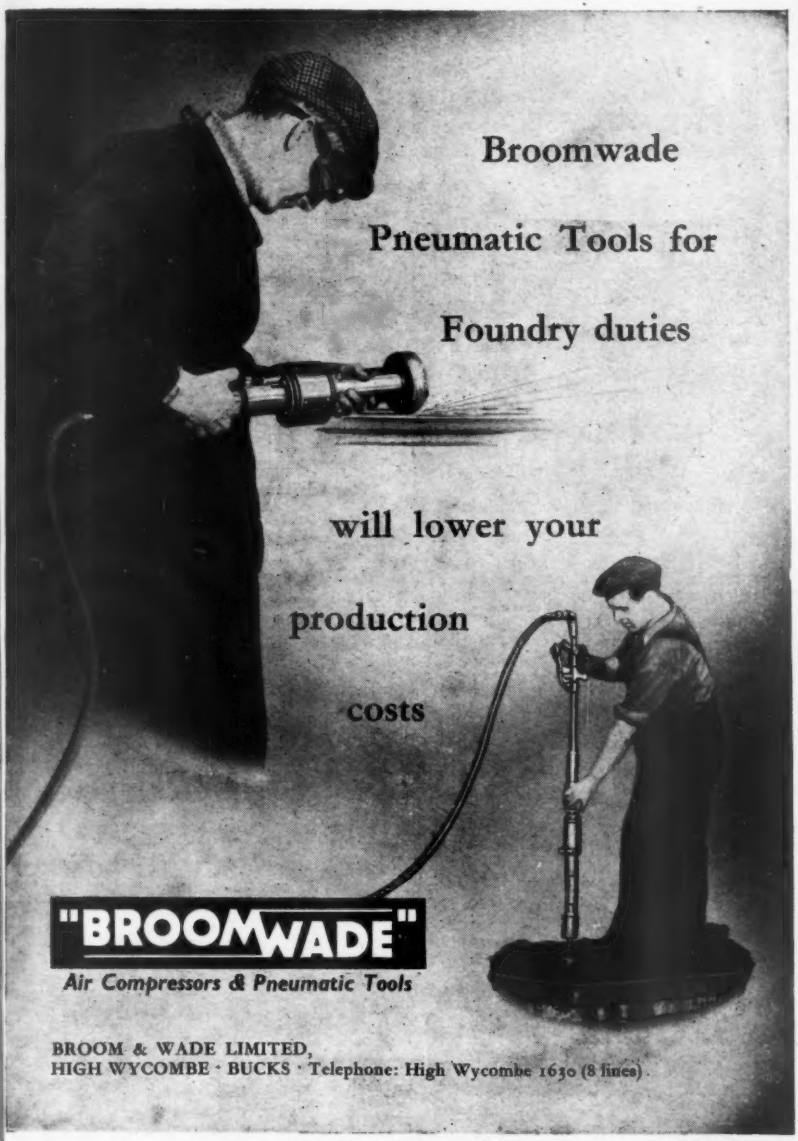
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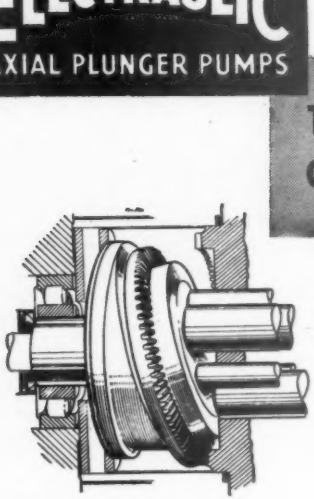
AXIAL PLUNGER PUMPS

THE PUMP WITH THE GEARED WOBBLER



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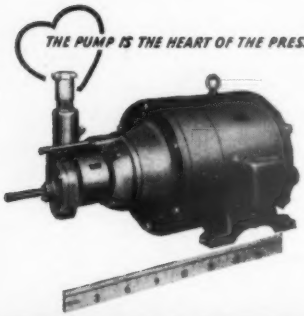

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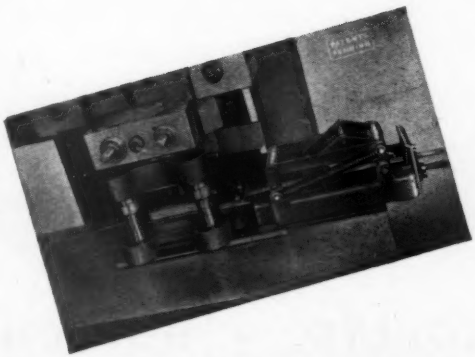

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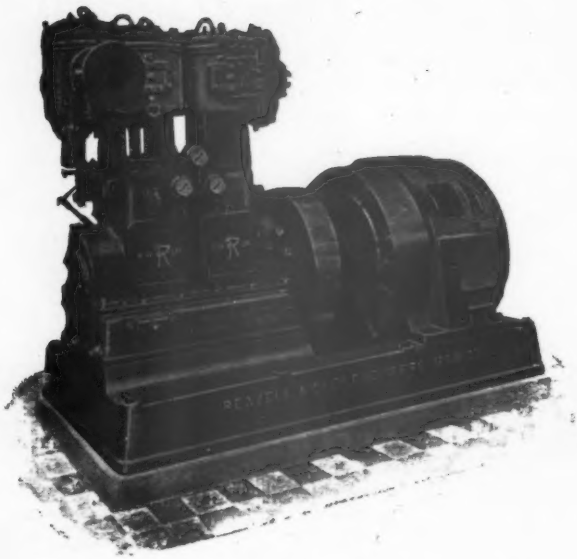

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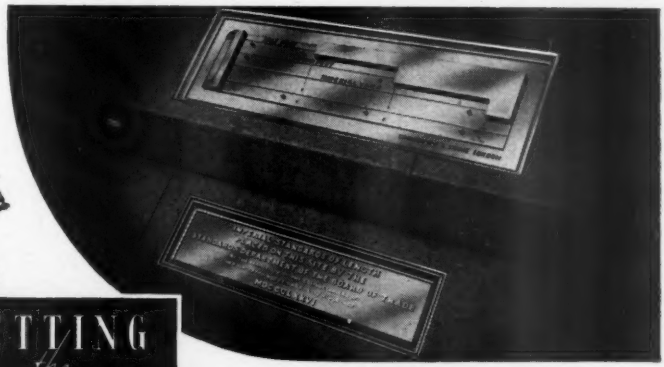

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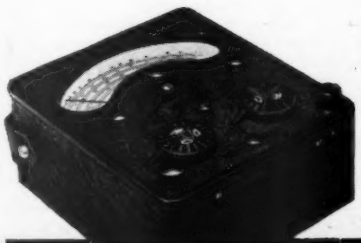

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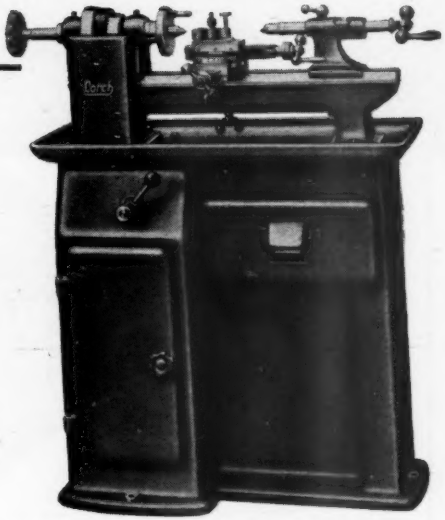

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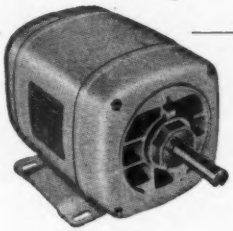

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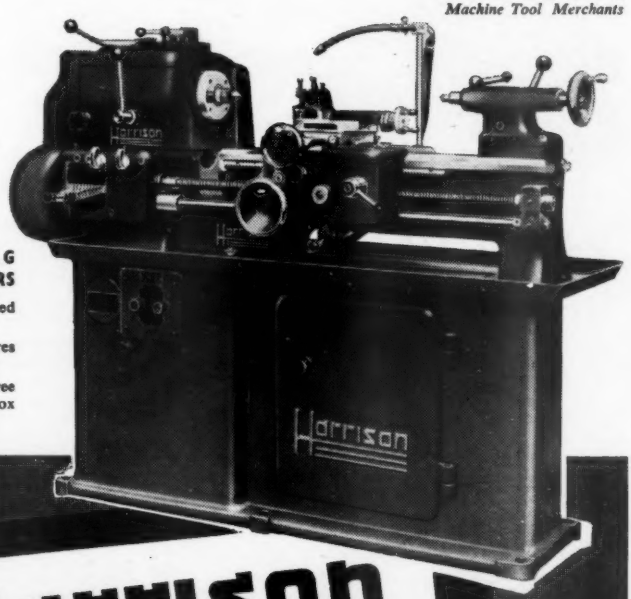

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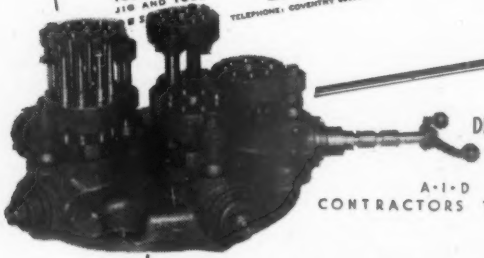

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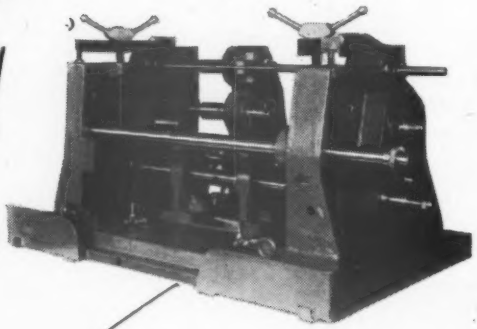

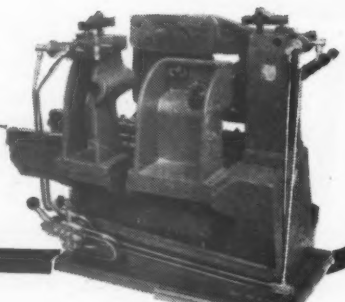

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For gears up to 14" diameter.

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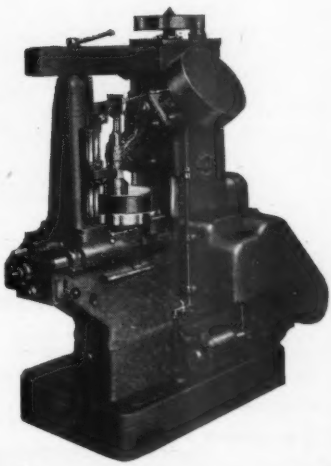

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Existing high standards in the quality of the products will be maintained, the change is in name only.

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"Durexsil" Fibre Combination Discs	to	"Tri-M-ite" Fibre Combination Discs
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"Hydro-Durexsil" Paper	to	"Wetordry Tri-M-ite" Paper
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There is an L.D.C. motor of the correct enclosure, including Flame-proof for any industrial situation.

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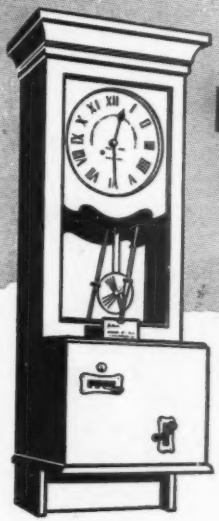

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The Gledhill-Brook Company was intimate with the early problems associated with the design and production of time recording machines, and was first in producing efficient electric impulse recorders with accurate time-keeping free from dependence on electric frequency or external influence. Wages and cost methods have a time basis — that is where we are concerned to help.

A large number of time recording models is now available covering most of the known needs for wages and labour cost control. One of industry's immediate needs is the reduction of waste—the waste of time that costs money.

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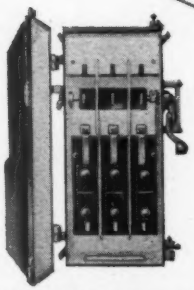
TIME RECORDERS

GLEDHILL-BROOK TIME RECORDERS LIMITED
20 EMPIRE WORKS HUDDERSFIELD

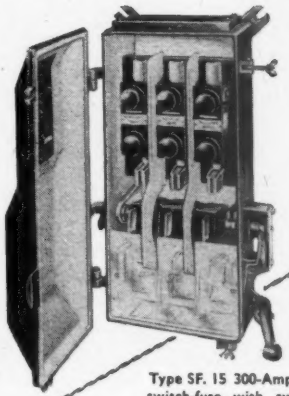
DONOVAN "SCRUTACT"

COMBINED SWITCHES & FUSES

FOR CONTINUITY OF SERVICE



Type SF. 15 200-Amp. inverted pattern "Scrutact" switch-fuse arranged to receive feeder cable at top.



Type SF. 15 300-Amp. "Scrutact" switch-fuse with switch below fuses-standard arrangement.

Whenever freedom from fuse contact heating or quick replacement of cartridges is required, Donovan "Scrutact" Combined-Switches-and-fuses will meet your requirements.

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THE DONOVAN ELECTRICAL COMPANY LTD

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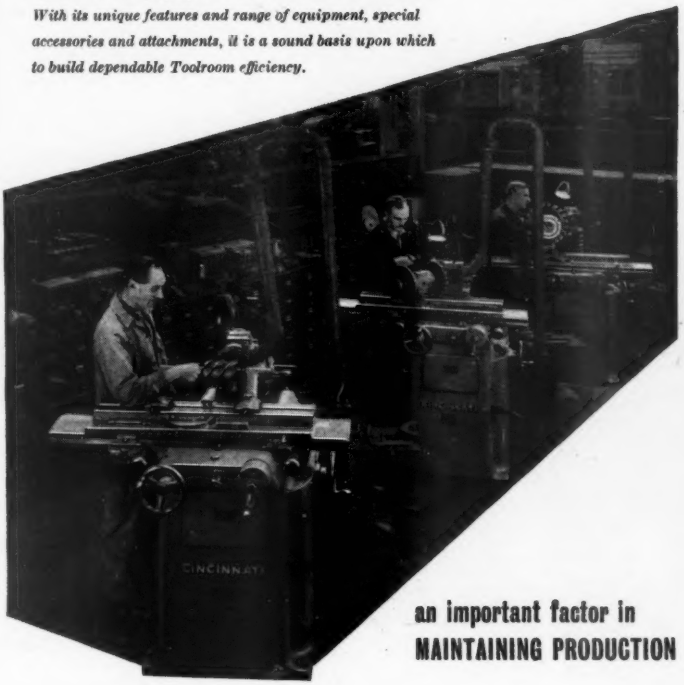
Electricity for PRODUCTIVITY

Issued by the British Electrical Development Association

Failure to ensure that cutting tools are properly sharpened and facilities are available for servicing them will seriously affect the smooth running of any production programme. When considering this problem, it is necessary to bear in mind not only the quantity of work to be handled, but the diversity of operations involved and thus be sure that the Cutter Grinders installed are capable of dealing with all types of work required of them. In this respect, the Cincinnati No. 2 Tool and Cutter Grinder has proved its all round excellence as an adjunct of production units where the range of work is continuous and complex. With its unique features and range of equipment, special accessories and attachments, it is a sound basis upon which to build dependable Toolroom efficiency.

efficient
TOOL SHARPENING



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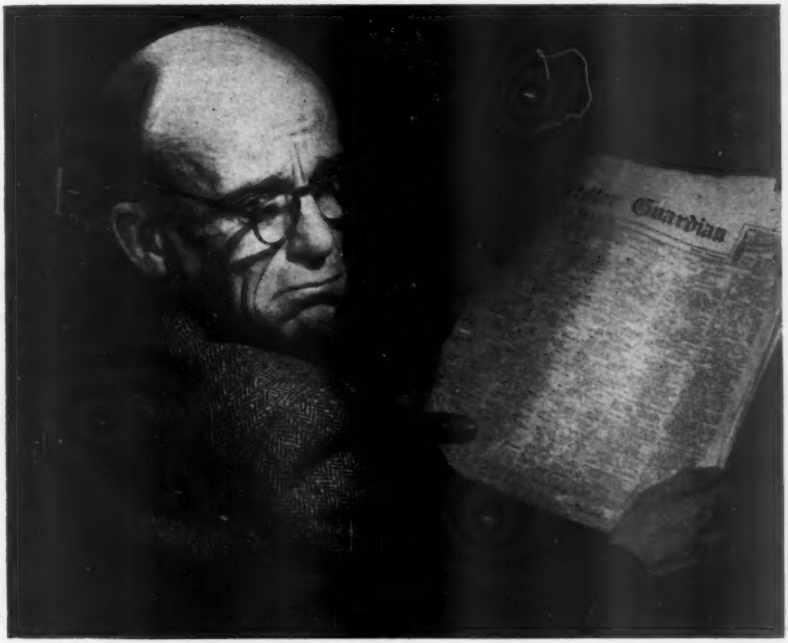

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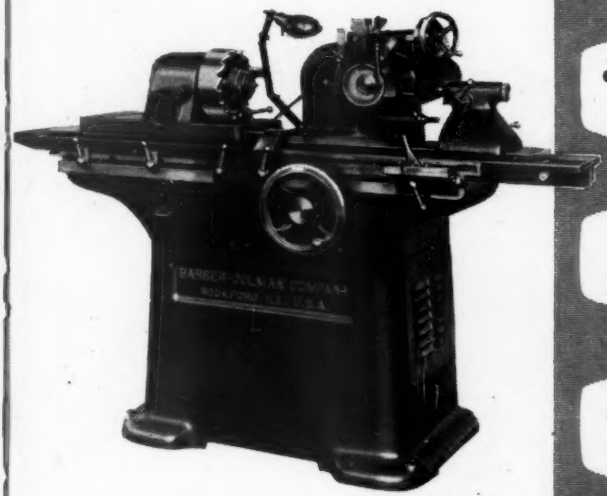

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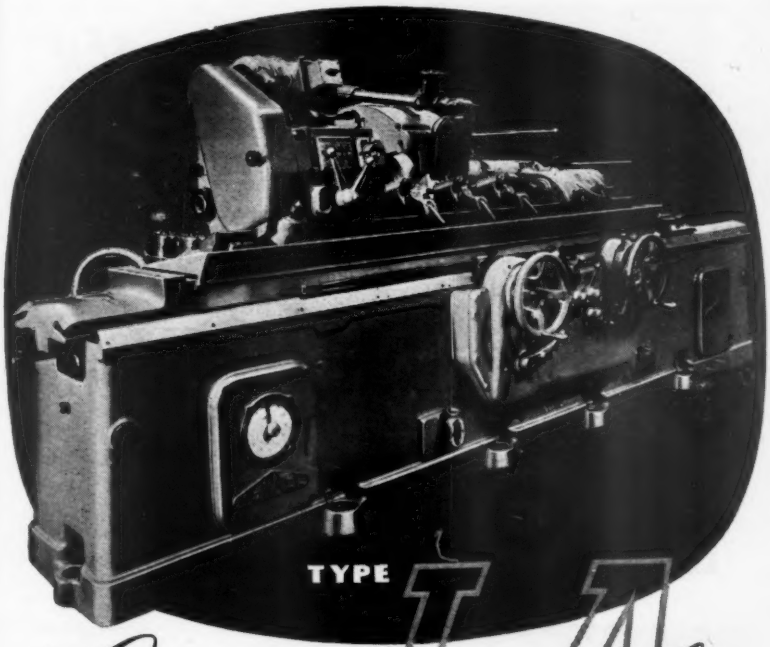
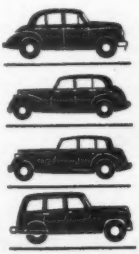


NEWALL "LA" GRINDER CAPACITY 16" x 60"



This Grinder, together with the LA Pin Grinder is being used extensively in the automobile industry today for the rapid production of crankshafts. These 2 machines make a complete production line for finished crankshaft production.

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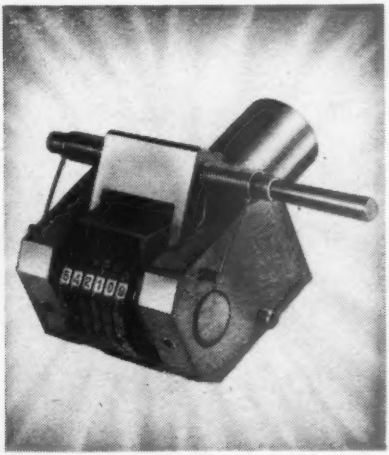

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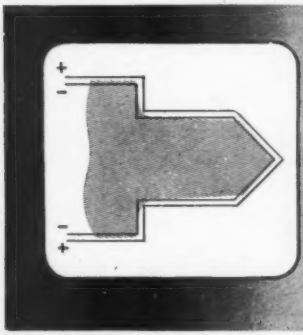

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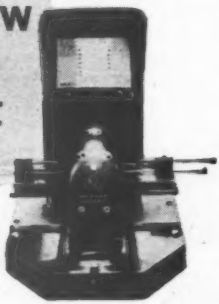

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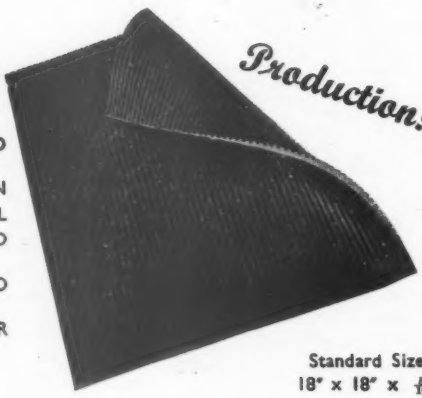

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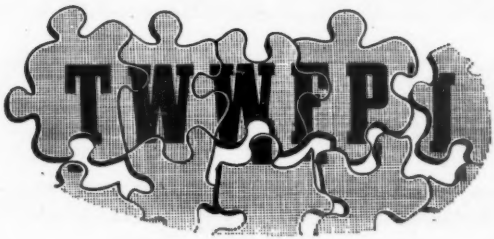

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The perfect co-ordination of a number of separate services produces the entity which is TWWFPI. Transportation dovetails with planning, planning fits in with production, production demands planned grouping and, overall, is the inescapable factor of opportunity hanging on the coat tails of time.

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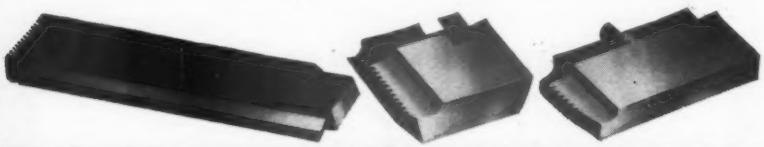

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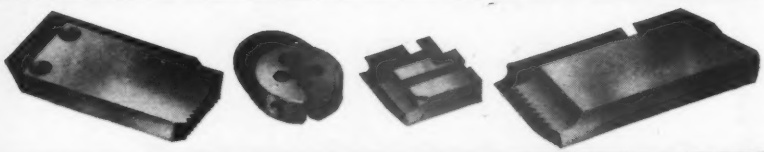

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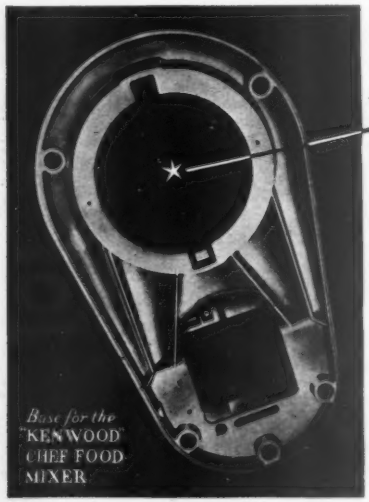

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The machine is self-contained, hydraulically operated, suitable for hand or semi-automatic operation. The machine is also fitted with hydraulic ejection and provision is made for automatic interlocking core pulling.

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- **Locking pressure 450 tons**
- **Platen dimensions 35½ in. x 35 in.**
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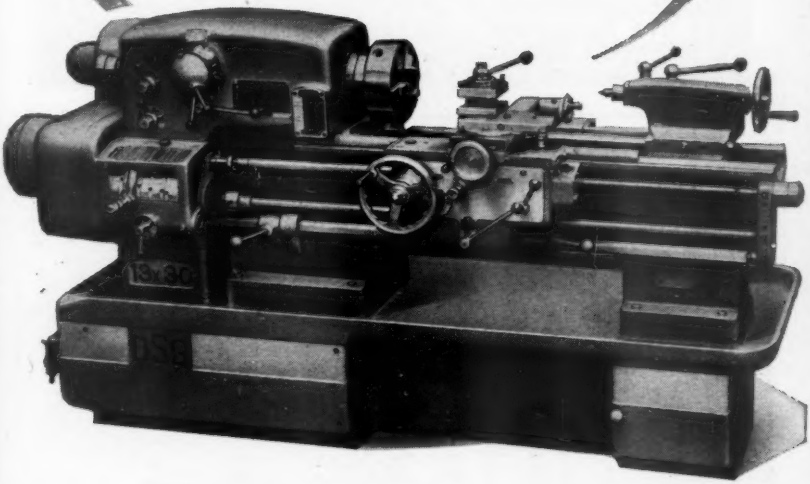

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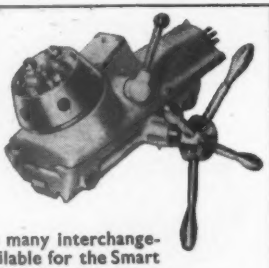
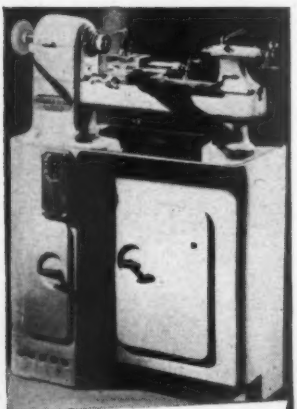
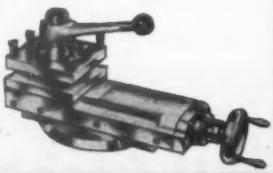




Here are two of the many interchangeable attachments available for the Smart & Brown Series 'L' Lathe (4" centre height). Above, Capstan Slide Rest. Each of six turrets has adjustable length stop with automatic indexing.

Below, Indexing Tool Slide. Four station.



S. & B. Series 'L' Precision Lathe.
Full data from Stockists or Sales Office.

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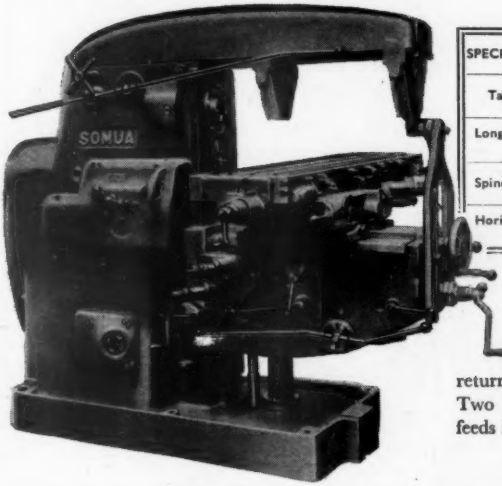

SPECIFICATION:	Model FH 2.B	Model FH 3.B
Table Size	56" x 14¾"	67" x 16¼"
Longitudinal traverse	32⅝"	40"
Spindle speeds:	16/1600 rpm	12.5/1250 rpm
Horizontal feeds	.5/50" per min	.5/50" per min

Automatic cycle giving rapid approach, slow cutting feed and rapid return to table.
Two control positions. Rapid feeds in all directions.

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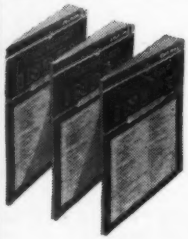

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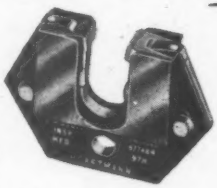

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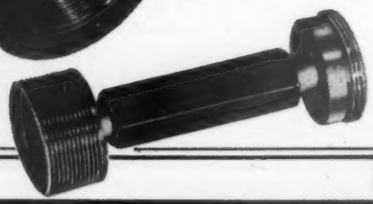

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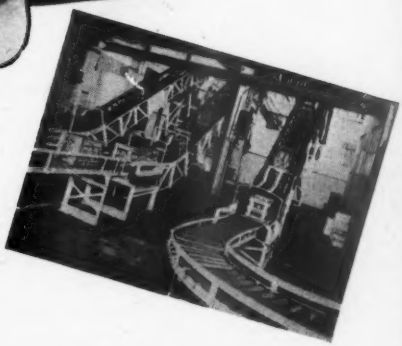

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INDEX TO ADVERTISEMENTS

	Page
Adam Machine Tool Co., Ltd.	xxxv
Ajax Machine Tool Co., Ltd.	lv
Automatic Coil Winder and Electrical Equipment Co., Ltd.	xxxiii
Barber & Colman, Ltd.	li
Birlec, Ltd.	—
Birmingham Aluminium Casting (1903) Co., Ltd.	—
Brammer, H., & Co., Ltd.	—
Bratby & Hinchliffe, Ltd.	xxxvi
British Electrical Development Association	xlvi
British Manufactured Bearings Co., Ltd.	lii
British Olivetti, Ltd.	—
Broom & Wade, Ltd.	xxvii
Burton, Griffiths & Co., Ltd.	ix
Carborundum Co., Ltd.	xlix
Carter, B. & F. & Co., Ltd.	—
Catmur Machine Tool Corporation Ltd.	xxix
Churchill, Charles, & Co., Ltd.	—
Churchill Machine Tool Co., Ltd., The	—
Cincinnati Milling Machines, Ltd.	xlvii
Cleaver Hume Index, The	lxii
Climax Rock Drill and Engineering Works, Ltd.	xv
Conveyancer Fork Truck, Ltd.	—
Coventry Gauge & Tool Co., Ltd.	xvii
Dawson Bros., Ltd.	xxii
Dean, Smith & Grace, Ltd.	lix
Deloro Stellite, Ltd.	xxxviii
Donovan Electrical Co., Ltd.	xlv
Drummond Bros., Ltd.	viii
Elgar Machine Tool Co., Ltd.	xix
Elliott, B., & Co., Ltd.	—
English Electric Co., Ltd., The	xiii
Firth, Brown Tools Ltd.	—
Flame Hardeners, Ltd.	—
Gill, Samuel, & Sons (Engineers), Ltd.	xl
Gledhill-Brook Time Recorders, Ltd.	xliv
G.P.A. Tools & Gauges, Ltd.	*Inside Front Cover*
Guest, Keen & Nettlefolds (Midlands), Ltd.	—
Guylee, Frank, & Son, Ltd.	*Inside Back Cover*
Harrison, T. S., & Sons, Ltd.	xxxix
Harris Tools, Ltd., John	—
Herbert, Alfred, Ltd.	xxiii
Hicks, Machinery, Ltd.	xii
Hilger & Watts, Ltd.	—
Holbrook Machine Tool Co., Ltd.	—
Holman Bros., Ltd.	*Back Cover*
Hoover, Ltd.	xxxvii
Hordern, Mason & Edwards, Ltd.	—
Horstmann Gear Co., Ltd., The	lxii
Imperial Smelting Corporation (Sales), Ltd.	iii, xviii
Jessop, William, & Sons, Ltd.	—
Jones, E. H. (Machine Tools) Ltd.	xxxiv
Kimbell, John, & Co., Ltd.	—
King Geo. W. Ltd.	xxi
Lancashire Dynamo & Crypto, Ltd.	xliii
Lang, John, & Sons, Ltd.	—
Lloyd, Richard, Ltd.	xxv
Lund, John, Ltd.	xxvi
Marshall-Richards Machine Co., Ltd.	—
Minnesota Mining & Manufacturing Co., Ltd.	xlii
Mollart Engineering Co., Ltd. The	l
Monks & Crane, Ltd.	xxxi
McKechnie Bros. Ltd.	—
Newall, A. P., & Co., Ltd.	xxiv
Newall Group Sales Ltd.	liii
Newton & Co., Ltd.	liv
Norgren, C. A., Ltd.	—
Norton Grinding Wheel Co., Ltd.	vi
New Era Publishing Co., Ltd., The	l
Parkinson, J., & Son (Shipley), Ltd.	v
Paterson Hughes Engineering Co., Ltd.	lxiii
Pitman, Sir Isaac, & Sons, Ltd.	—
Projectile and Engineering Co., Ltd., The	lviii
Pryor, Edward, & Son, Ltd.	liv
Pultra, Ltd.	—
Ransomes, Sims, & Jefferies, Ltd.	—
Reavell & Co., Ltd.	xxx
Roto-Finnish, Ltd.	xx
Sanderson Bros. & Newbould, Ltd.	lx
Schrader's (A.) Son	—
Scrivener, Arthur, Ltd.	—
Selson Machine Tool Co. Ltd.	lxi
Sheffield Twist Drill & Steel Co., Ltd., The	vii
Smar & Brown (Machine Tools), Ltd.	lx
Sparklets, Ltd.	—
Spencer & Halstead, Ltd.	—
Streetly Manufacturing Co., Ltd., The	—
Sunbeam Anti-Corrosives, Ltd.	lxvi
Swift, Geo., & Son, Ltd.	—
Sykes, W. E., Ltd.	xiv, xli
Tecalemit, Ltd.	xlviii
Teleflex Products, Ltd.	—
Technically Controlled Castings Group, The	lvi
Towler Bros. (Patents), Ltd.	xxviii
Unbrako Socket Screw Co., Ltd.	xvi
Van Moppes & Sons (Diamond Tools), Ltd.	—
Vaughan, Edgar, & Co., Ltd.	—
Vaughan, Crane Co., Ltd.	lii
Vulcascot (Great Britain) Ltd.	lvi
Ward, H. W., & Co., Ltd.	iv
Ward, Thos., W., Ltd.	lvii
Wickman, Ltd.	x, xi
Wild Barfield Electric Furnaces, Ltd.	—
Winn, Chas. & Co., Ltd.	lviii
Winn, Martin, W., Ltd.	—
Wolverhampton Die Casting Co., Ltd.	xxxii
Zinc Alloy Die Casters Association	—

Page
xliii
—
xxv
xxvi
—
xlii
l
xxxi
—
xxiv
liii
liv
—
vi
l
v
lxiii
—
lviii
liv
—
—
xxx
xx
lx
—
—
lxi
vii
lx
—
—
lxvi
—
iv, xli
xlviii
—
e lvi
xxviii
xvi
—
—
lii
lvi
iv
lvii
x, xi
—
lviii
—
xxxii
—

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Printed by Maxwell, Love & Co. Ltd. Bradley's Buildings, White Lion Street. London, N.1

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